5-4120-352-14

TM 5-4120-352-14

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR, ORGANIZATIONAL DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL

AIR CONDITIONER, HORIZONTAL, COMPACT, 9000 BTUH 208 VOLT, 3 PHASE, 60 HERTZ (AMERICAN AIR FILTER CO., MODEL CH609-3) (4120-00-411-5444)

HEADQUARTERS, DEPARTMENT OF THE ARMY
MARCH 1978

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READEX FICHE best copy available

WARNING
HIGH VOLTAGE

is used in the operation of this equipment.

DEATH ON CONTACT

or severe injury may result if personnel fail to observe safety precautions.

Always disconnect the air conditioner from power source before performing maintenance on this equipment.

If power must remain on for troubleshooting, exercise extreme care to avoid contact with any electrical component, fan, fan motor, etc.

Do not operate the air conditioner without louvers, top covers, and guards in place and tightly secured.

WARNING
REFRIGERANT UNDER PRESSURE

is used in the operation of this equipment.

DEATH

or severe injury may result if personnel fail to observe safety precautions.

Never use a heating torch on any part that contains refrigerant-22.

Avoid bodily contact with liquid refrigerant and avoid inhaling refrigerant gas.

WARNING

Dry cleaning solvent, P-D-680, used to clean parts, is potentially dangerous to personnel and property.

Avoid repeated and prolonged skin contact.

Do not use near open flame or excessive heat.

Flash point of solvent is 100° - 138°F (38° - 59°C).

TECHNICAL MANUAL

NO. 5-4120-352-14

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 10 March 1978

OPERATOR, TO ORGANIZATIONAL DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL

AIR CONDITIONER, HORIZONTAL, COMPACT, 9000 BTUH
208 VOLT, 3 PHASE, 60 HERTZ
(AMERICAN AIR FILTER CO., MODEL CH609-3)
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Table of Contents

Paragraph Page

CHAPTER 1. INTRODUCTION

Section I. General 1-1 1-1
II. Description and Data 1-8 1-4

CHAPTER 2. OPERATING INSTRUCTIONS

Section I. Operating Procedures 2-1 2-1
II. Controls and Instruments 2-5 2-4
III. Operation Under Usual Conditions 2-7 2-8
IV. Operation Under Unusual Conditions 2-10 2-15

CHAPTER 3. OPERATOR/CREW MAINTENANCE INSTRUCTIONS

Section I. Lubrication Instructions 3-1 3-1
II. Preventive Maintenance Checks and Services 3-3 3-1
III. Troubleshooting 3-5 3-2
IV. Operator's Maintenance of Air Conditioner 3-7 3-3

CHAPTER 4. ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. Service Upon Receipt of Material 4-1 4-1
II. Movement to a New Worksite 4-3 4-1
III. Repair Parts, Special Tools and Equipment 4-4 4-1
IV. Lubrication 4-7 4-1
V. Preventive Maintenance Checks and Services 4-9 4-1
VI. Troubleshooting 4-11 4-2
VII. Radio Interference Suppression 4-13 4-6
VIII. Maintenance of Covers, Louvers and Filters 4-16 4-8
IX. Maintenance of Condenser Coil, Evaporator Coil and Drains 4-22 4-16
X. Maintenance of Fresh Air Vent Damper and Control 4-26 4-17
XI. Maintenance of Electrical System 4-31 4-20
XII. Maintenance of Heaters and Thermostatic Switch 4-34 4-21
XIII. Maintenance of Fan Motors 4-36 4-25
XIV. Maintenance of Fan Motor Switches 4-39 4-31
XV. Maintenance of Control Module 4-41 4-33
XVI. Maintenance of Junction Box 4-43 4-36
XVII. Maintenance of Transformer, Rectifier, and Pressure Switches 4-44 4-40
XVIII. Maintenance of Compressor 4-48 4-42
XIX. Maintenance of Refrigeration System 4-50 4-44

Table of Contents (Cont)

			Paragraph	Page
CHAPTER	5.	DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE INSTRUCTIONS		
Section	I.	Repair Parts, Special Tools and Equipment	5-1	5-1
	II.	Troubleshooting	5-4	5-1
	III.	General Maintenance Instructions	5-6	5-6
	IV.	Removal and Installation of Major Components and Assemblies	5-16	5-7
CHAPTER	6.	REPAIR INSTRUCTIONS		
Section	I.	Refrigeration System	6-1	6-1
APPENDIX	A.	REFERENCES		A-1
	B.	MAINTENANCE ALLOCATION CHART		B-1
	C.	BASIC ISSUE ITEM LIST, ITEMS TROOP INSTALLED OR AUTHORIZED LIST		C-1
ALPHABETICAL INDEX				I-1

List of Illustrations

Number	Title	Page
1-1	Air conditioner, left front, 3/4 view	1-2
1-2	Air conditioner, right rear, 3/4 view	1-3
1-3	Air conditioner, top view, top covers removed	1-5
1-4	Control system schematic diagram	1-9
1-5	Wiring diagram	1-11
2-1(A)	Base mounting holes	2-2
2-1(B)	Typical installation of air conditioner to enclosure	2-2
2-2	Ground wire installation	2-3
2-3(A)	Controls and instruments	2-5
2-3(B)	Controls and instruments	2-6
2-3(C)	Controls and instruments	2-7
2-4	Starting instructions for cooling	2-9
2-5	Operating instructions for cooling	2-10
2-6	Starting instructions for heating	2-11
2-7	Operating instructions for heating	2-12
2-8	Operating instructions for ventilating	2-13
2-9	Air conditioner shutdown instructions	2-14
4-1	R. F. I. capactiors	4-7
4-2	Evaporator air louvers, air filter and mist eliminator	4-9
4-3	Fresh air vent screens, condenser guard and condenser louver blades	4-11
4-4	Louver blade push-on nuts and louver control attachment	4-13
4-5	Housing covers	4-15
4-6	Evaporator drain tubing	4-17
4-7	Vent damper control	4-18
4-8	Vent damper	4-19
4-9	Heater thermostatic switch, exploded view	4-22
4-10	Heater elements and support	4-24
4-11	Evaporator fan and motor assembly	4-26
4-12	Condenser fan and motor	4-28
4-13	Condenser fan motor and mounting plate, exploded view	4-29
4-14	Motor thermal protector housing	4-30
4-15	Condenser fan motor thermostatic switch	4-32
4-16	Control module connector knob and bulb mounting	4-34
4-17	Control module less cover	4-35
4-18	Junction box, partially removed	4-37
4-19	Junction box components, exploded view	4-39
4-20	Transformer, rectifier, and pressure switches	4-41
4-21	Compressor, electrical connector and terminal box cover	4-43
5-1	Refrigerant flow diagram	5-2
5-2	Compressor, removal and installation	5-8
5-3	Evaporator coil and mist eliminator holder, removal and installation	5-10

Number	Title	Page
5-4	Condenser coil, removal and installation	5-12
5-5	Condenser louver control, removal and installation	5-14
5-6	Condenser louver actuator cylinder, removal and installation	5-15
5-7	Charging valves, pressure relief valve, and pressure switch connections, removal and installation	5-17
5-8	Dehydrator, receiver and solenoid valves, removal and installation	5-19
5-9	Thermal expansion valve, removal and installation	5-21
5-10	Quench valve and pressure regulator valve, removal and installation	5-23
6-1	Discharging and purging refrigerent system	6-2
6-2	Charging the refrigerant system (Sheet 1 of 2)	6-4
6-2	Charging the refrigerant system (Sheet 2 of 2)	6-5
6-3	Solenoid valve, exploded view	6-6
6-4	Fan motor, exploded view	6-8
6-5	Control module, exploded view	6-10

List of Tables

Number	Title	Page
3-1	Operator/Crew Preventive Maintenance Checks and Balances	3-1
3-2	Troubleshooting	3-2
4-1	Organizational Preventive Maintenance Checks and Balances	4-2
4-2	Troubleshooting	4-3
5-1	Troubleshooting	5-3
6-1	Normal Operating Pressures	6-3

CHAPTER 1
INTRODUCTION

Section I. GENERAL

1-1. Scope

This manual is for your use in operating and maintaining the AAF Model CH609-3 air conditioner.

1-2. Maintenance Forms and Records

Maintenance forms and records that you are required to use are explained in TM 38-750.

1-3. Reporting of Errors

You can improve this manual by calling attention to errors and by recommending improvements. You will find several copies of DA Form 2028-2 (TEST) (Recommended Changes to Equipment Technical Manuals) in the back of this manual; there is also a sample of DA Form 2028-2, properly filled out. If these have already been used, you may submit your ideas on DA Form 2028 or in a letter. Mail DA Form 2028-2, DA Form 2028 or your letter to: Commander, U. S. Army Troop Support and Aviation Materiel Readiness Command, ATTN: DRSTS-MTP, 4300 Goodfellow Blvd., St. Louis, MO 63120. A reply will be furnished directly to you. Thanks for your help.

1-4. Equipment and Serviceability Criteria

This equipment is not covered by an ESC.

1-5. Destruction of Army Materiel to Prevent Enemy Use

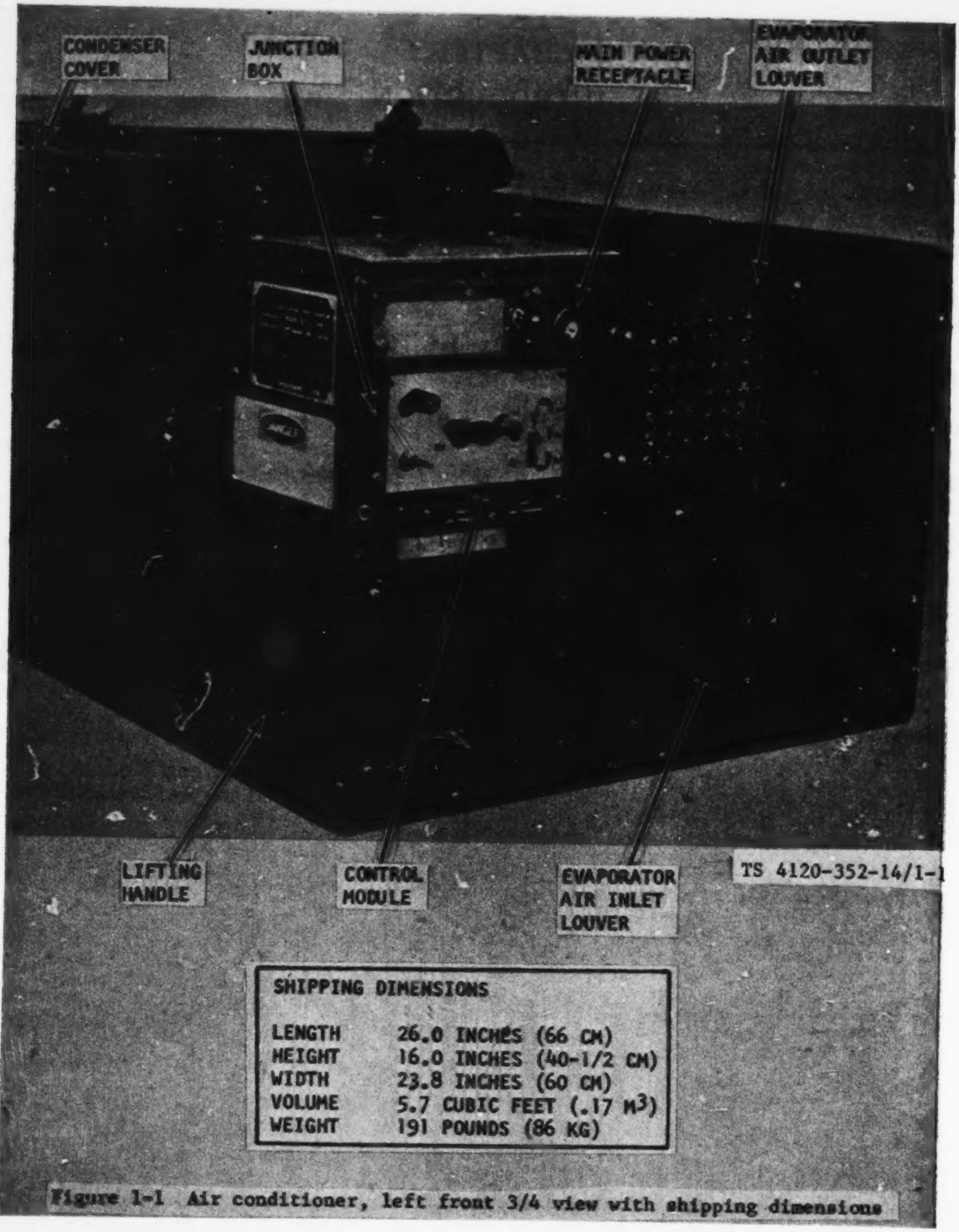
Instructions for destruction of materiel to prevent enemy use will be in accordance with TM 750-244-3 (Procedures for Destruction of Equipment to Prevent Enemy Use).

1-6. Administrative Storage

Preparation, care and removal of equipment in administrative storage will be in accordance with the applicable requirements of TM 740-90-1 (Administrative Storage of Equipment).

1-7. Difference Between Models

This manual covers only AAF Model CH609-3.


CONDENSER COVER
JUNCTION BOX
MAIN POWER RECEPTACLE
EVAPORATOR AIR OUTLET LOUVER
LIFTING HANDLE
CONTROL MODULE
EVAPORATOR AIR INLET LOUVER
TS 4120-352-14/1-

SHIPPING DIMENSIONS

LENGTH	26.0 INCHES (66 CM)
HEIGHT	16.0 INCHES (40-1/2 CM)
WIDTH	23.8 INCHES (60 CM)
VOLUME	5.7 CUBIC FEET (.17 M^3)
WEIGHT	191 POUNDS (86 KG)

Figure 1-1 Air conditioner, left front 3/4 view with shipping dimensions

TM 5-4120-352-14

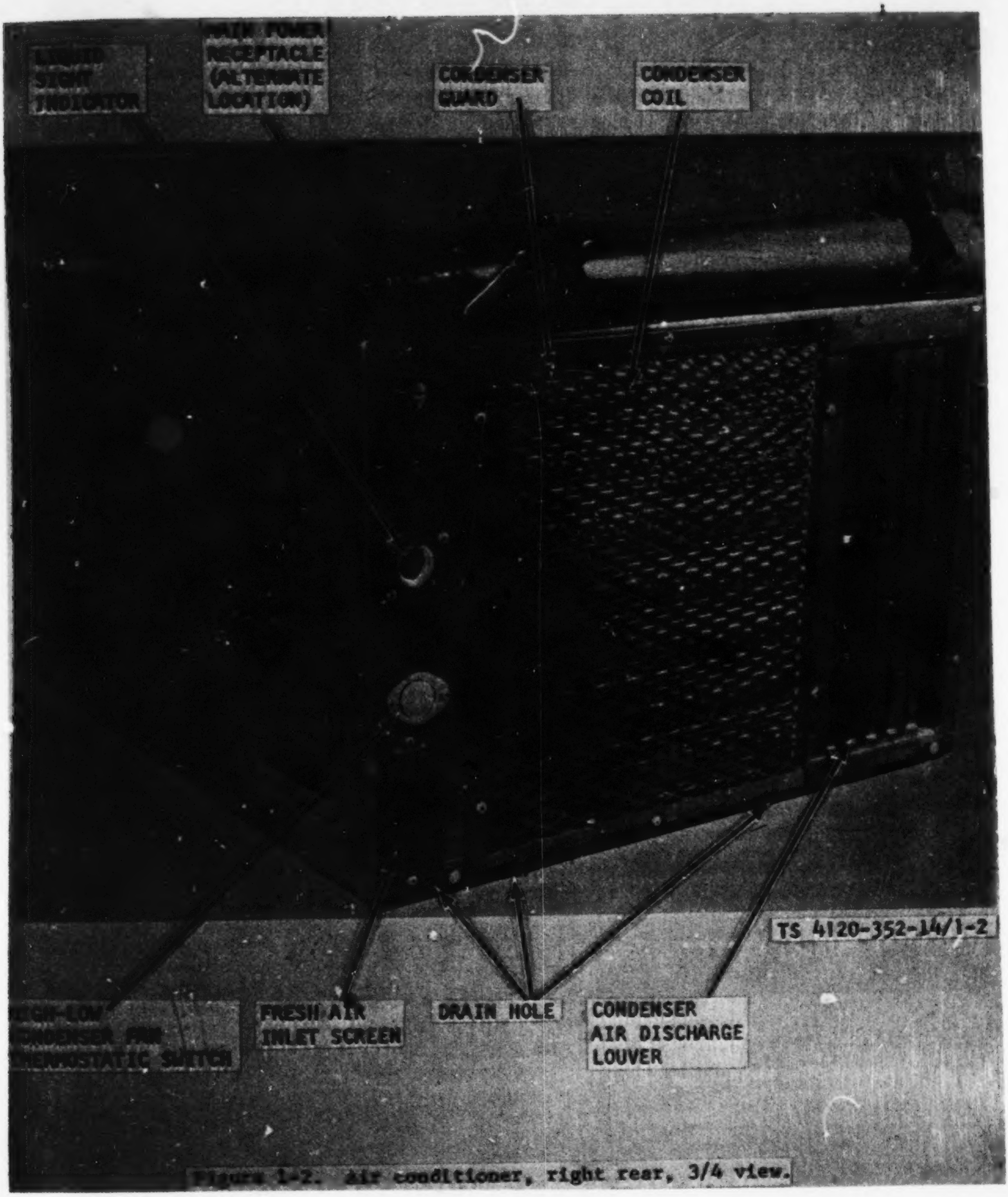

LIQUID SIGHT INDICATOR
MAIN POWER RECEPTACLE (ALTERNATE LOCATION)
CONDENSER GUARD
CONDENSER COIL
TS 4120-352-14/1-2
IGH-LOW ONDENSER FAN HERMOSTATIC SWITCH
FRESH AIR INLET SCREEN
DRAIN HOLE
CONDENSER AIR DISCHARGE LOUVER

Figure 1-2. Air conditioner, right rear, 3/4 view.

Section II. DESCRIPTION AND DATA

1-8. Description

a. General. Air conditioner model CH609-3 (figures 1-1 thru 1-3) is a lightweight, compact, horizontal unit designed for cooling and heating air to a desired predetermined range, and circulating the conditioned air to provide heating or cooling of equipment or personnel within the air- conditioned area.

b. Evaporator Section. The evaporator section contains the evaporator coil, fan motor and fan, control module and junction box, air filter, heating elements and thermal expansion valve. When cooling, air in the evaporator section is forced over the evaporator coil by the evaporator fan which lowers the temperature of the air before it is distributed into the space to be conditioned. When heating, air is circulated over the heating elements and distributed by the evaporator fan. Evaporator fan speed is controlled by a selector switch located on control module.

c. Condenser Section. The condenser section contains the hermetically sealed motor compressor, condenser coil, condenser fan and motor, actuator, service valves, filter dryer, equalizer solenoid valve, liquid quench valve, pressure regulator valve, electrical power connectors, and the necessary refrigerant. The compressor mechanically compresses refrigerant vapor to a condensing condition and discharges it into the condenser coil through the hot gas line. Outside air, drawn over the condenser coil surface by the condenser fan, condenses the refrigerant vapor to a liquid. The liquid then leaves the condensing coil and returns to the thermal expansion valve through the liquid line. Condenser fan speed is controlled with a thermostatic switch located on rear of unit. At ambient temperature of 100°F +5°F (38°C +3°C) or above, the condenser fan speed will turn at high speed, but at ambient temperature below 100°F +5°F (38°C +3°C) the condenser fan will turn at low speed. Due to residual mass heat there will be a delayed reaction time for this to happen when ambient temperature drops below the 100°F (38°C) changeover point.

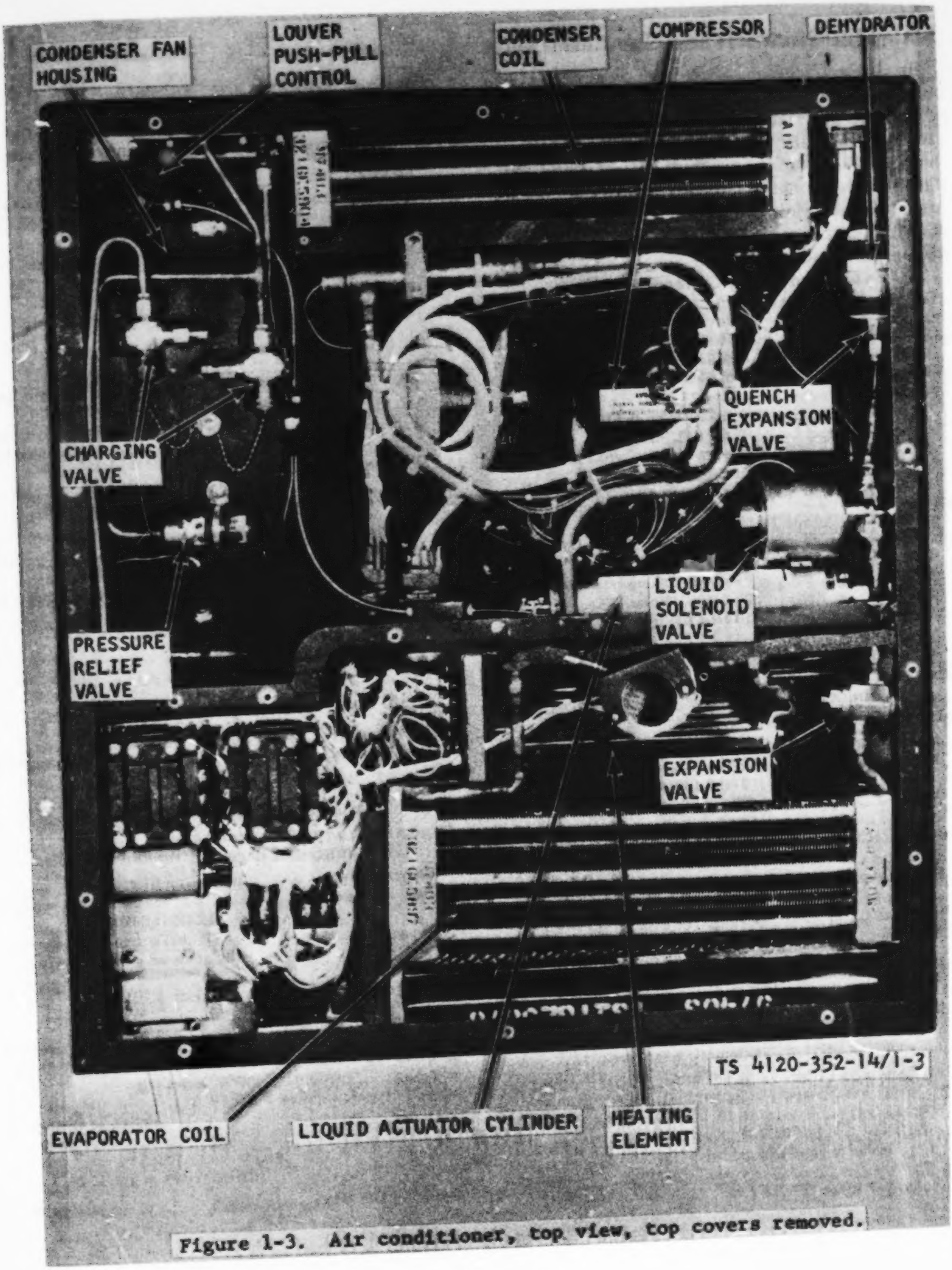

CONDENSER FAN HOUSING
LOUVER PUSH-PULL CONTROL
CONDENSER COIL
COMPRESSOR
DEHYDRATOR
QUENCH EXPANSION VALVE
CHARGING VALVE
LIQUID SOLENOID VALVE
PRESSURE RELIEF VALVE
EXPANSION VALVE
TS 4120-352-14/1-3
EVAPORATOR COIL
LIQUID ACTUATOR CYLINDER
HEATING ELEMENT

Figure 1-3. Air conditioner, top view, top covers removed.

1-9. Identification and Tabulated Data

*a. **Identification.*** Each air conditioner has one major identification plate mounted on the side of the unit. The plate specifies nomenclature, manufacturer, military part number, BTU/hr., phase, hertz, volts, serial er, contract number, and shipping weight. A manufacturer's identification plate mounted just below the military plate contains the manufacturer's name and address and the model and serial numbers.

b. Tabulated Data, General.

(1) Air conditioner, model CH 609-3.

Nomenclature	Air conditioner, horizontal, compact
Manufacturer	American Air Filter Co., Inc.
Capacity:	
Cooling	9,000 BTU/hr.
Heating	7,000 BTU/hr.
Phase	3
Hertz	50/60
AC volts	208

(2) Dimensions and weights.

Length	26 in. (66 cm.)
Height	16 in. (40-1/2 cm.)
Width	23-3/4 in. (60 cm.)
Weight	191 lbs. (87 kg.)

c. Tabulated Data, Components Subject to Operator Maintenance.

(1) Condenser fan motor (B2) and/or evaporator fan motor (B3).

Manufacturer	IMC Magnetics Corp.
Model	FBT4625-3 (modified by marking "97403 13216E6140-3")
Volts	208
Hertz	50/60
Phase	3
RPM	3450/1725
Horsepower:	
High	0.73
Low	0.16
Amperes:	
High	2.3
Low	0.9
Duty	Continuous
Motor drive	Direct
Thermal protector	Automatic reset type
High	opens at 250°F + 9°F (120°C +5°C)
Low	opens at 300°F + 10°F (150°C +5°C)
Rotation (Facing shaft end)	Counterclockwise

(2) Compressor (includes crankcase heater).

Manufacturer	Welco Inductries, Inc.
Model	MIL-R-9-VAC-620 (modified by marking "97403 13208E4182-7")
Oil charge	24 ounces (.7 kg)
Volts	208
Hertz	50/60
Phase	3
Weight (with oil)	47-1/4 pounds (21.5 kg)

(3) Solenoid valves (L1 and L2).

Manufacturer	Jackes-Evans Mfg. Co.
Part number	OB2S3 (modified by marking "97403 13216E6158")
Type	Pilot operated diaphragm type, normally open (when not energized)
Volts	24 DC

(4) Heater element (HR1 through HR6).

Manufacturer	Edwin L. Weigand Co.
Part number	12-112163 (modified by marking "97403 13216E6124-2")
Sheath	Nickel-iron-chromium alloy, tubular type
Element	Nickel-chromium
Volts	120
Watts	315

(5) Liquid sight indicator.

Manufacturer	Sporlan Valve Co.
Part number	SA12S (modified by marking "97403 13216E6155")

d. Tabulated Data, Components Subject to Organizational Maintenance.

(1) Compressor Circuit Breaker (CB-1).

Manufacturer	Heinemann Electric
Part number	JA3Z18-1 (modified by marking "97403 13216E6205-1")
Type	3 PST, series trip with mechanically actuated auxillary switch

(2) Control circuit breaker (CB2).

Manufacturer	Texas Instruments, Inc.
Part number	2MC-102-1 (modified by marking "97403 13216E6178-1")
Type	SPST, series trip

(3) Rectifier (CR1).

Manufacturer	Motorla Semiconductor Products, Inc.
Part number	MDA952-3 (modified by marking "97403 13216E6223")

(4) Time delay relay (K1).

Manufacturer	E. V. Naylor Laboratories, Inc.
Part number	TQ1D25 (modified by marking "97403 13216E6182")
Alternate	HI-G Inc., Part No. 1600-3590 (modified by marking)
Type	SPDT
Time delay	25 + 6 seconds

(5) Heater relay (K2).

Part number	MS24192D1
Type	3 PST, normally open
Volts	28 VDC

(6) Compressor motor relay (K3)

Part number	MS24192D1
Type	3 PST, normally open
Volts	28 VDC

(7) Condenser fan relay (K4).

Manufacturer	Potter and Brumfield
Part number	KA4619 (modified by marking "97403 13216E6184")
Type	3 PDT, armature type
Coil voltage	24 VDC

(8) R. F. I. capacitor (C1).

Type designation	CK14AX103K
Specification	MIL-C-11015/20A
Type	Fixed
Dielectric	Ceramic
Capacitance	10,000 pf + 10 pf

(9) R. F. I. capacitor (C2 or C6).

Manufacturer	Paktron
Part number	Paktron WA .056
Type	Fixed
Dielectric	Mylar
Capacitance	0.056 mfd + 10%
Working voltage	400 VDC

(10) Rotary selector switch (S1).

Manufacturer	Ark-Les Switch Corp.
Part number	2267A1 (modified by marking "97403 13216E6201")
Type	8 PDT, 4 switch wafers
Number of switch positions	5

(11) Toggle switch (S2).

Manufacturer	Cutler-Hammer
Part number	8906K1462 (modified by marking "97403 13216E6200")
Type	3 PDT, slow make, slow break contacts

(12) Temperature selector switch (S3).

Manufacturer	Penn controls, Inc.
Part number	A19AGE23 (modified by marking "97403 13216E6203-1")
Type	SPDT
Temperature range	60°F to 90°F

(13) High pressure switch (S4).

Manufacturer	Penn Controls, Inc.
Part number	P20DA-18 (modified by marking "97403 13216E6215-3")
Type	SPST, normally closed, with trip free manual reset
Pressure setting	445° + 10 psig

(14) Low pressure switch (S5).

Manufacturer	Penn Controls, Inc.
Part number	P20BA-16 (modified by marking "97403 13216E6215-1")
Type	SPST, normally closed, with trip free manual reset
Pressure setting	15 + 5 psig

(15) Heater thermostatic switch (S6).

Manufacturer	Therm-O-Disc, Inc.
Part number	HLAS4947 (modified by marking "97403 13216E6224")
Type	DPST, normally closed, bimetallic
Reset	Automatic
Contacts open (temp. rise)	150°F + 5°F (65.5°C + 3°C)
Contacts close (temp. drop)	110°F + 5°F (43°C 3°C)

(16) Condenser fan relay thermostatic switch (S7).

Manufacturer	Thermo-O-Disc, Inc.
Part number	14T22 (modified by marking "97403 13216E6217") and changing mounting holes to slots)
Type	SPST, normally open, non-adjustable bimetallic disc
Contacts close (temp. rise)	100°F + 5°F (38°C + 3°C)

(17) Transformer (T1).

Manufacturer	Signal Transformer Co., Inc.
Part number	5249 (modified by marking "97403 13216E6214") and changing mounting slots to holes)
Rating	
Input	120 VAC, 120 watts, 50 to 500 hertz
Output	30 VAC, 4 amps

(18) Thermal expansion valve.

Manufacturer	Alco Controls Corp.
Part number	HNE1HW100-6A (modified by marking "97403 13216E6160-1")
Inlet	1/4 ODF
Outlet	3/8 ODF
Cap tube length	30"
Nominal capacity	1 ton
Superheat (factory set)	6°F + 1/2°F at a 32°F bath temperature (3-1/3°C + 1/3°C at a 0°C bath temperature)

(19) Liquid quench valve.

Manufacturer	Alco Controls Corp.
Part number	HN1/4CW16A (modified by marking "97403 13216E6174-1")
Inlet	1/4 ODF
Outlet	3/8 ODF
Cap tube length	30"
Nominal capacity	1/4 ton
Superheat (factory set)	16°F + 1/2°F at a 32°F bath temperature 9°C + 1/3°C at a 0°C bath temperature

(20) Refrigerant service valves.

Manufacturer	Robinair
Part number	V25-4

(21) Pressure regulator valve.

Manufacturer	Controls Co. of America
Model number	104A
Part number	70034-187 (modified by marking "97403 13216E6171")
Adjustment range	0 to 80 psig
Setting	68 psig

(22) Dehydrator.

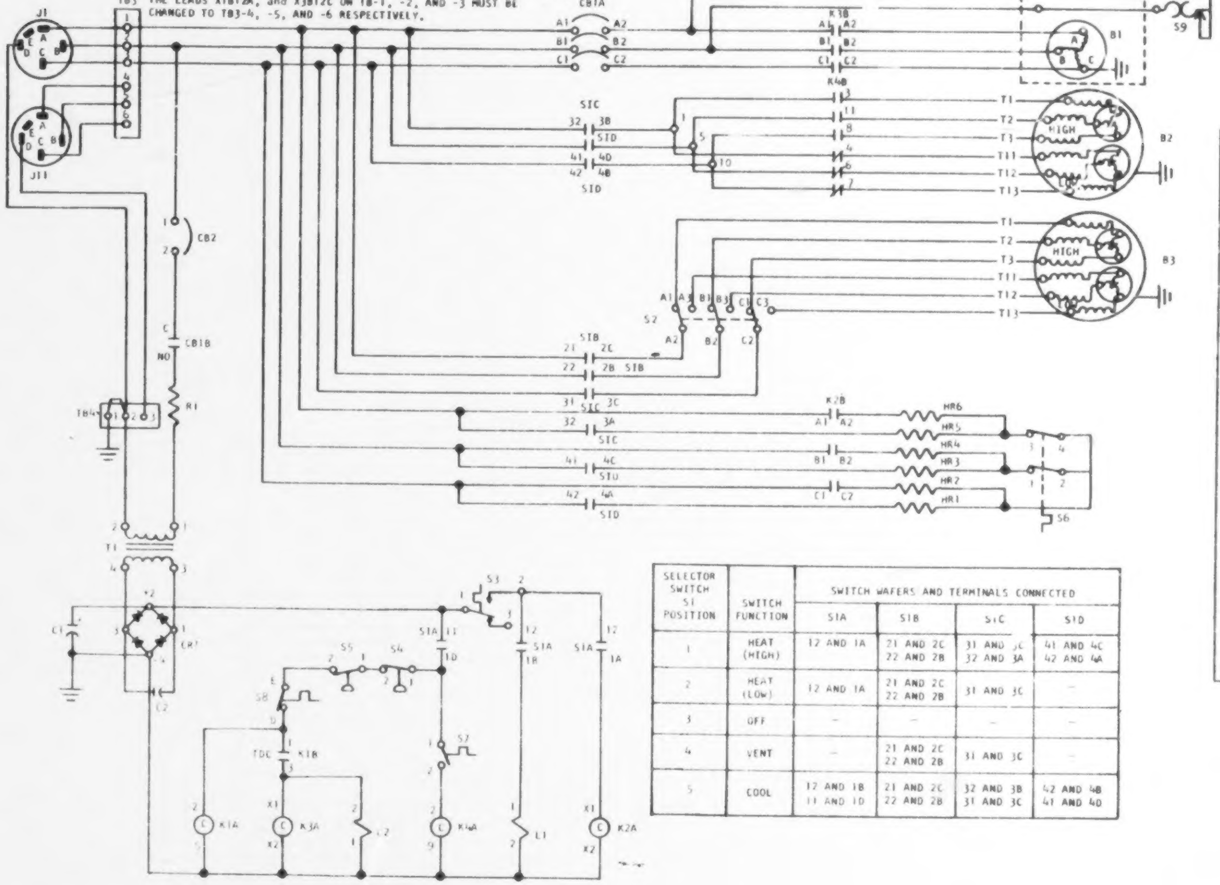
Manufacturer	Alco Valve Co.
Part number	ADK032 (modified by marking "97403 13216E5918-1")
Type	Sealed and nonrefillable

(23) Actuator cylinder assembly.

Manufacturer	Robertshaw Control Co.
Part number	PO11-22 (modified by marking "97403 13216E6128" and changing cable attachment plate
Stroke	.952 in.
Full stroke pressure (no load)	240 + 20 psig
Pressure to start stroke stroke	165 + 15 psig

1-10. Diagrams.

a. Control system schematic diagram. Refer to figure 1-4 for system electrical schematic diagram.



TO ENERGIZE THE UNIT FROM THE AUXILIARY POWER INPUT SOURCE (J11) THE LEADS X1B12A, and X3B12C ON TB-1, -2, AND -3 MUST BE CHANGED TO TB3-4, -5, AND -6 RESPECTIVELY.

SELECTOR SWITCH S1 POSITION	SWITCH FUNCTION	SWITCH WAFERS AND TERMINALS CONNECTED			
		S1A	S1B	S1C	S1D
1	HEAT (HIGH)	12 AND 1A	21 AND 2C 22 AND 2B	31 AND 3C 32 AND 3A	41 AND 4C 42 AND 4A
2	HEAT (LOW)	12 AND 1A	21 AND 2C 22 AND 2B	31 AND 3C	–
3	OFF	–	–	–	–
4	VENT	–	21 AND 2C 22 AND 2B	31 AND 3C	–
5	COOL	12 AND 1B 11 AND 1D	21 AND 2C 22 AND 2B	32 AND 3B 31 AND 3C	42 AND 4B 41 AND 4D

COMPONENT REFERENCE LIST	
ELEC REF DESIG	DESCRIPTION
B1	COMPRESSOR, ROTARY
B2	MOTOR, CONDENSER FAN
B3	MOTOR, EVAPORATOR FAN
C1	CAPACITOR, FILTER
C2	CAPACITOR, FILTER
CB1	CIRCUIT BREAKER, COMPRESSOR
CB2	CIRCUIT BREAKER, CONTROL
CR1	RECTIFIER, SEMICONDUCTOR DEVICE
E1	TERMINAL STUD (CONTROL MODULE GRD)
E2	TERMINAL STUD (JUNCTION BOX GRD)
E3 AND E4	TERMINAL STUD (SYSTEM GRD)
HR1 THRU 6	HEATER ELEMENT
HR7	CRANKCASE HEATER
J1 AND J11	CONNECTOR, RECEPTACLE, POWER INPUT
K1	RELAY, TIME DELAY
K2	RELAY, HEATER
K3	RELAY, COMPRESSOR MOTOR
K4	RELAY, CONDENSER FAN
L1	VALVE, SOLENOID, BY-PASS
L2	VALVE, SOLENOID, PRESSURE EQUALIZER
R1	RESISTOR, SURGE
S1	SWITCH, ROTARY SELECTOR
S2	SWITCH, TOGGLE
S3	SWITCH, TEMPERATURE CONTROL
S4	SWITCH, HIGH PRESSURE CUTOUT
S5	SWITCH, LOW PRESSURE CUTOUT
S6	SWITCH, HEATER CUTOUT
S7	SWITCH, THERMOSTATIC
S8	SWITCH, THERMAL, COMPRESSOR
S9	SWITCH, THERMOSTATIC, CRANKCASE HEATER
T1	TRANSFORMER
TB3	TERMINAL BOARD, POWER INPUT,
TB4	TERMINAL BOARD, GROUND

TS 4120-352-14/1-4

Figure 1-4. Control system schematic diagram.

*b. **Wiring Diagram.*** Refer to figure 1-5 for system wiring diagram.

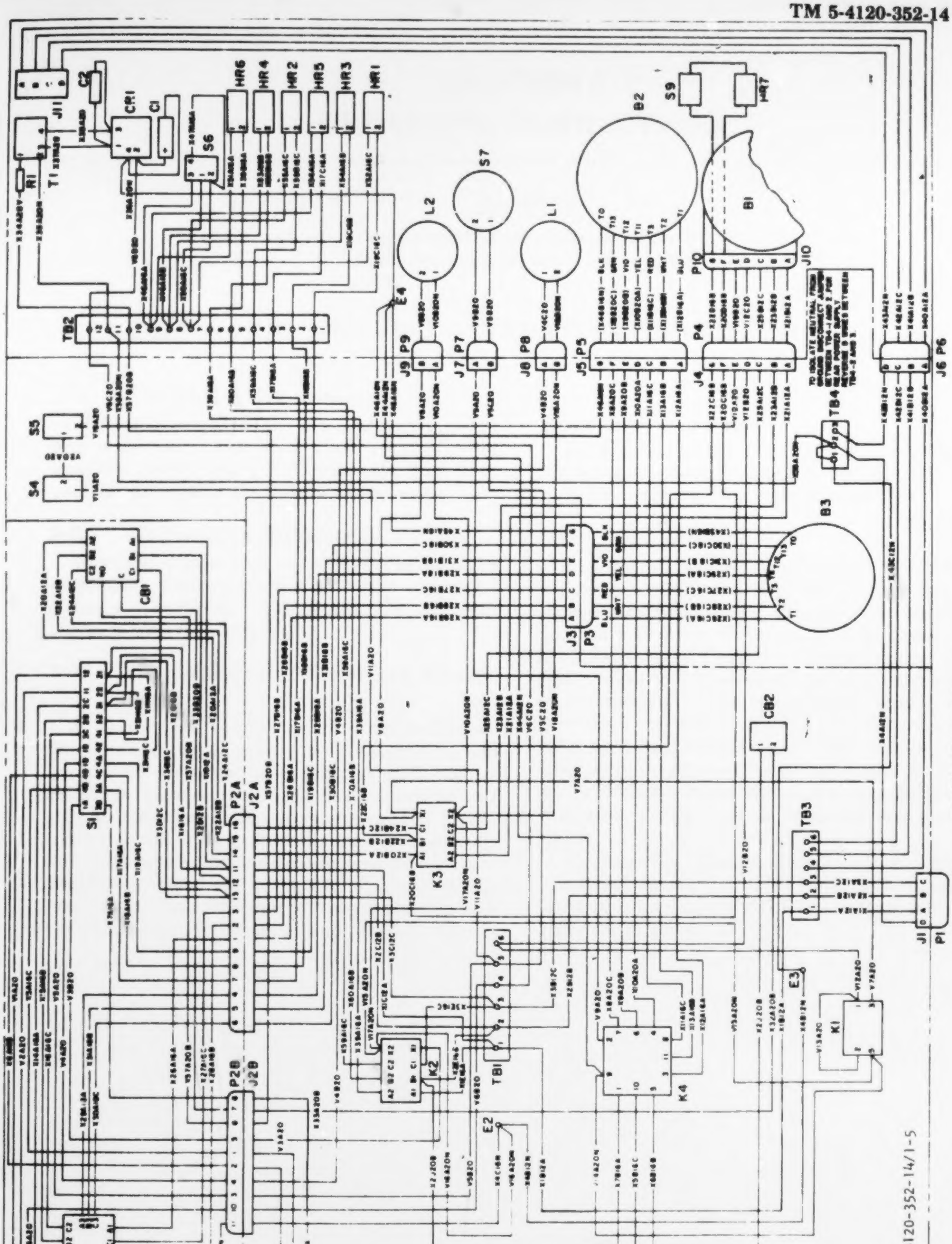

J11
C2
CR1
C1
R1
T1
S6
HR6
HR4
HR2
HR5
HR3
HR1
S9
HR7
B2
S7
L2
L1
B1
P10
J10
TB2
E4
P9
J9
P7
J7
P8
J8
P5
J5
P4
J4
J6
P6
TB4
S5
S4
B3
J3
P3
CB1
S1
P2A
J2A
CB2
K3
TB3
J1
P1
TB1
K2
K4
E3
K1
P2B
J2B
E2
E1
S2
S3
BLK
GRN
VIO
YEL
RED
WHT
BLU
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Figure 1-5. Wiring Diagram

CHAPTER 2
OPERATING INSTRUCTIONS

WARNING

If equipment fails to operate refer to troubleshooting procedures in chapter 3.

Section I. OPERATING PROCEDURES

2-1. Unloading Equipment

The total weight of the air conditioner is 191 pounds (87 kg.). Use a hand truck or forklift of at least 300 pounds capacity to unload the unit. Keep unit upright during the unloading operation.

2-2. Unpacking Equipment

Move the unit as near to the site of installation as possible. Remove crating hardware and metal straps, being careful not to damage the unit with the tools used for uncrating.

2-3. Inspecting and Servicing Equipment

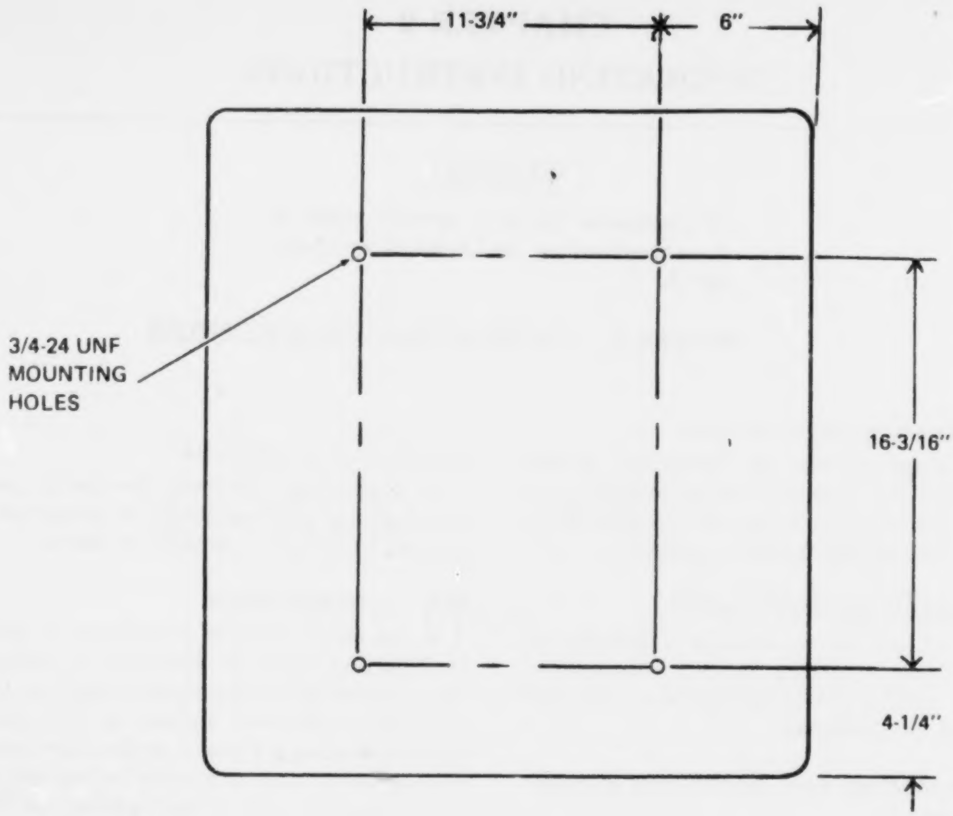
*a. **Inspection.*** Inspect the entire air conditioner for signs of damage, missing or loose hardware, and any defects that may have been incurred during shipment. Make a thorough check to see that all wiring, lines, and tubing are secure; and pay particular attention to the evaporator and condenser coils and main power receptacle connectors. Be sure that visible wiring and insulation are not frayed or broken. Check the evaporator and condenser fan motors. Report all damage and defects to organizational maintenance.

*b. **Servicing.*** Perform the daily preventive maintenance services listed in paragraph 3-4. Be sure all hardware is securely in place.

2-4. Installation

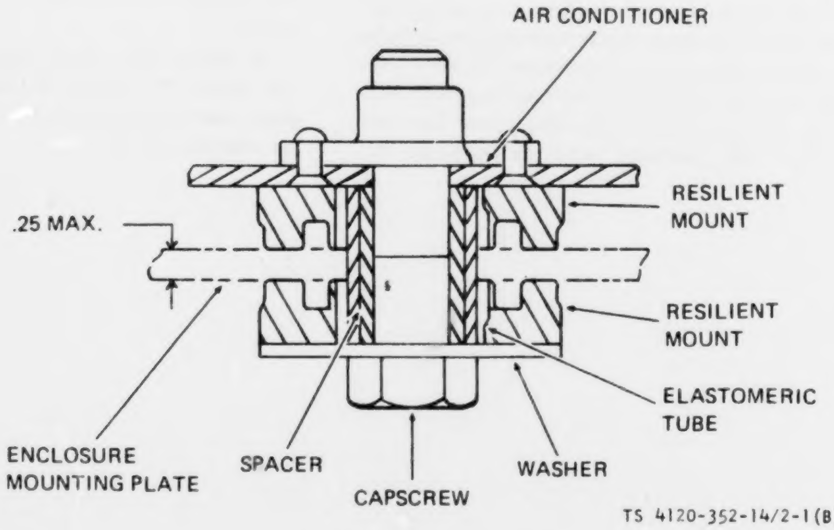
*a. **General.*** The air conditioner is shipped assembled and ready for operation. It contains a full charge of refrigerant and compressor oil. Install the unit on a firm, level surface to allow proper condensate drainage. Place it so that the control panel and condenser and evaporator louvers are accessible to the operator and to maintenance personnel. Be sure there are no obstructions in front of any air intake or discharge louvers or other openings that may cause insufficient flow of air into or out of the air conditioner. If the unit is van mounted, report any such obstructions to organizational maintenance.

*b. **Mounting.*** Base mounting hole dimensions are shown on figure 2-1(A). The resilient mount parts shown in figure 2-1(B) are shipped with the air conditioner.


11-3/4"
6"
3/4-24 UNF
MOUNTING
HOLES
16-3/16"
4-1/4"

TS 4120-352-14/2-1(A).

Figure 2-1(A). Base mounting holes.

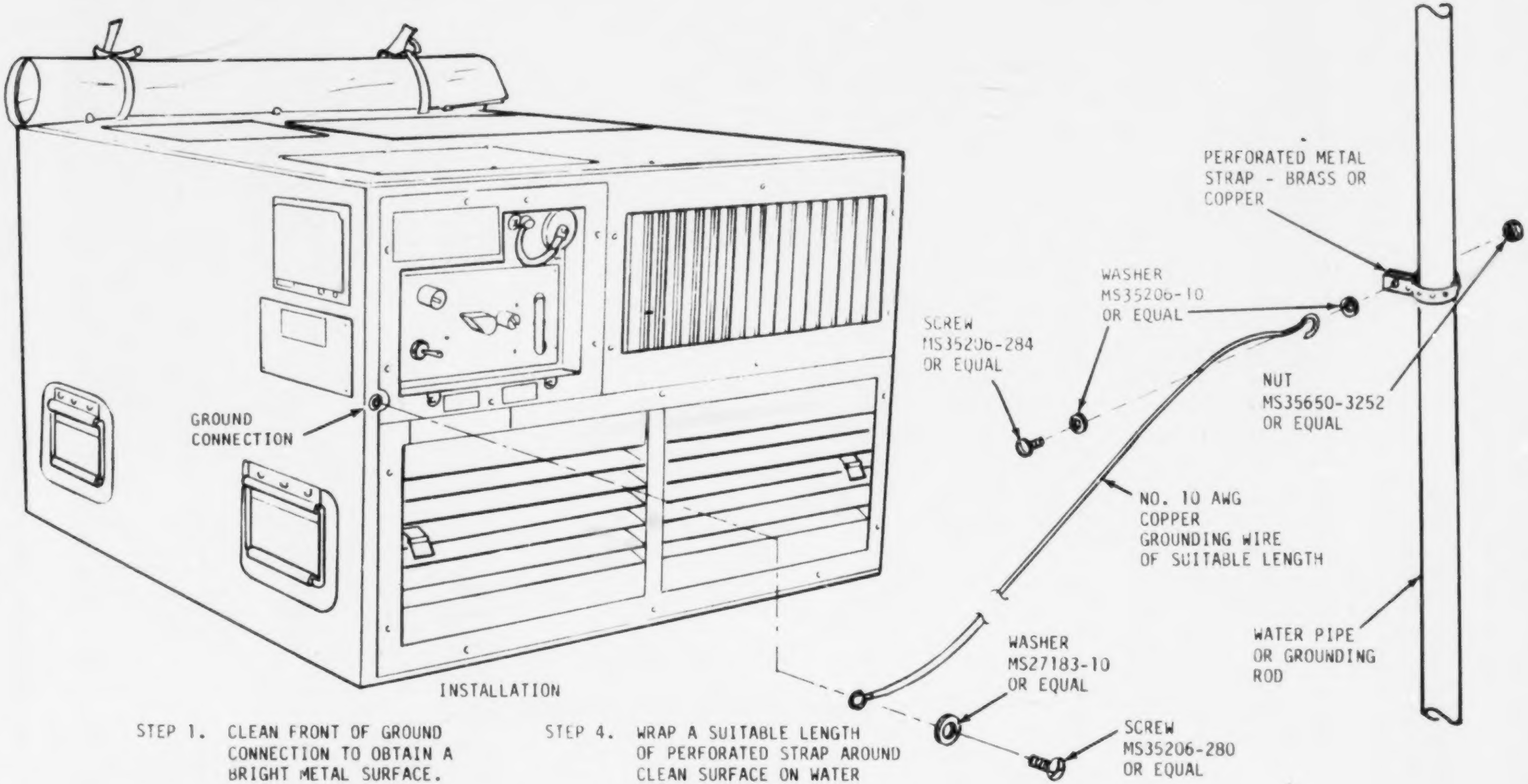

AIR CONDITIONER
RESILIENT
MOUNT
.25 MAX.
RESILIENT
MOUNT
ELASTOMERIC
TUBE
ENCLOSURE
MOUNTING PLATE
SPACER
CAPSCREW
WASHER

TS 4120-352-14/2-1(B).

Figure 2-1(B). Typical installation of air conditioner to enclosure.

CAUTION

For safe operation connect a No. 10 AWG (min.) ground wire to ground connection, as shown in figure 2-2.


PERFORATED METAL STRAP - BRASS OR COPPER
WASHER MS35206-10 OR EQUAL
SCREW MS35206-284 OR EQUAL
NUT MS35650-3252 OR EQUAL
GROUND CONNECTION
NO. 10 AWG COPPER GROUNDING WIRE OF SUITABLE LENGTH
WATER PIPE OR GROUNDING ROD
WASHER MS27183-10 OR EQUAL
SCREW MS35206-280 OR EQUAL
TS4120-352-14/2-2

INSTALLATION

STEP 1. CLEAN FRONT OF GROUND CONNECTION TO OBTAIN A BRIGHT METAL SURFACE.

STEP 2. REMOVE INSULATION FROM ENDS OF GROUNDING WIRE OR USE BARE WIRE. MAKE LOOP AT WIRE ENDS.

STEP 3. USING 1/4-20 SCREW AND WASHER, ATTACH ONE END OF WIRE TO AIR CONDITIONER FRONT PANEL GROUND CONNECTION.

STEP 4. WRAP A SUITABLE LENGTH OF PERFORATED STRAP AROUND CLEAN SURFACE ON WATER PIPE OR GROUNDING ROD. DO NOT USE GAS PIPE.

STEP 5. USING 1/4-20 SCREW, TWO WASHERS AND NUT, ATTACH OTHER END OF GROUNDING WIRE TO STRAP IN A MANNER SUCH AS TO SECURELY TIGHTEN STRAP TO PIPE AND WIRE TO STRAP.

Figure 2-2. Ground Wire Installation

*c. **Connections***. Connect the main power cable.

*d. **Air Ducts***. Connect air ducts contingent to site of installation. Mount air filter in duct work if an evaporation return air duct is required.

NOTE

Operation without filtration will clog coils.

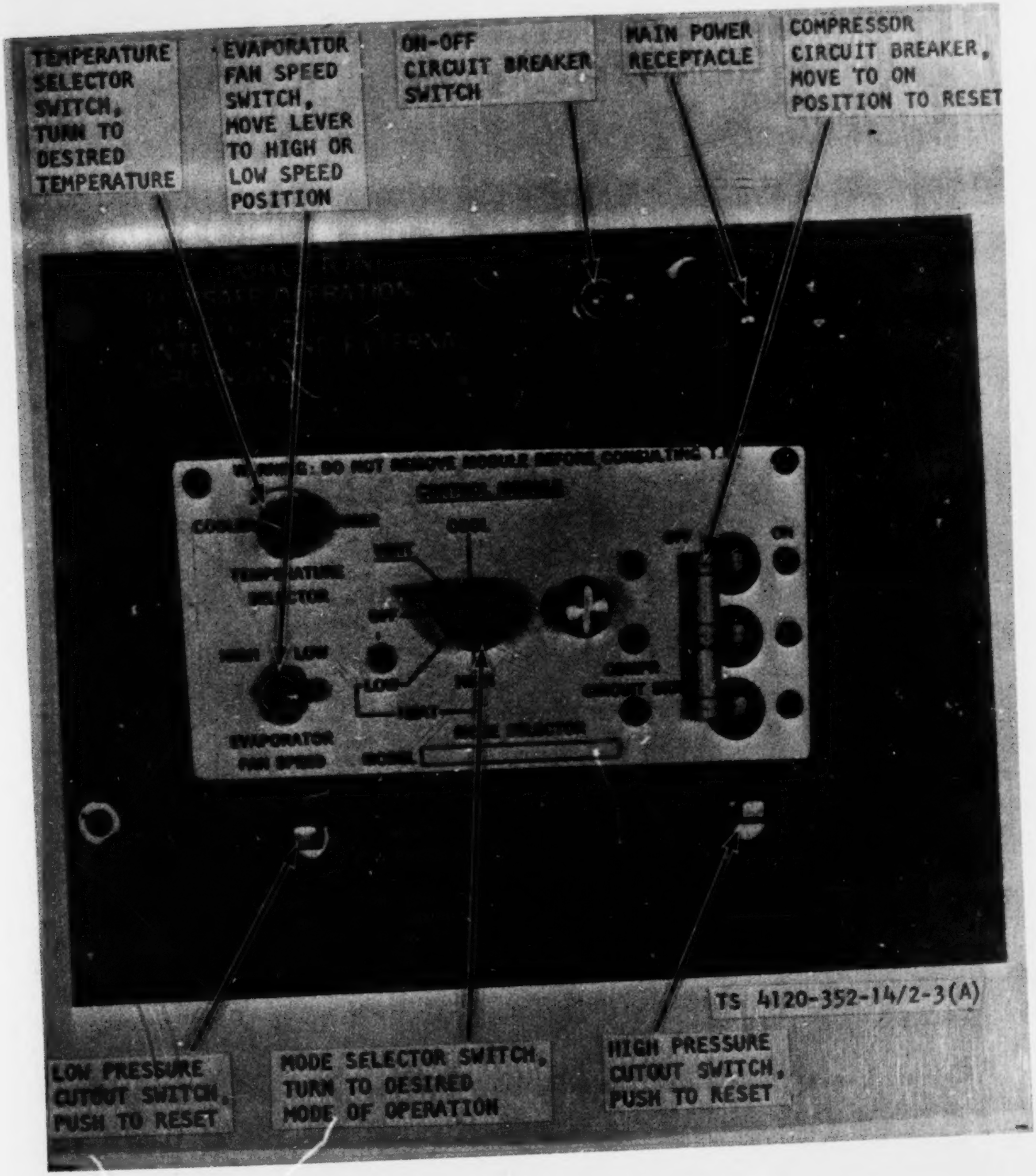
Section II. CONTROLS AND INSTRUMENTS

2-5. General

This section describes, locates and illustrates the various controls and provides the operator/crew sufficient information to insure proper operation of the air conditioner.

2-6. Controls and Instruments

The location and the function of the controls and instruments are illustrated in figure 2-3.


CONTROL MODULE
COOL
TEMPERATURE SELECTOR
HIGH
LOW
EVAPORATOR FAN SPEED
VENT
OFF
HEAT
MODE SELECTOR
OFF
ON

TEMPERATURE SELECTOR SWITCH, TURN TO DESIRED TEMPERATURE

EVAPORATOR FAN SPEED SWITCH, MOVE LEVER TO HIGH OR LOW SPEED POSITION

ON-OFF CIRCUIT BREAKER SWITCH

MAIN POWER RECEPTACLE

COMPRESSOR CIRCUIT BREAKER, MOVE TO ON POSITION TO RESET

TS 4120-352-14/2-3(A)

LOW PRESSURE CUTOUT SWITCH, PUSH TO RESET

MODE SELECTOR SWITCH, TURN TO DESIRED MODE OF OPERATION

HIGH PRESSURE CUTOUT SWITCH, PUSH TO RESET

Figure 2-3A. Controls and instruments

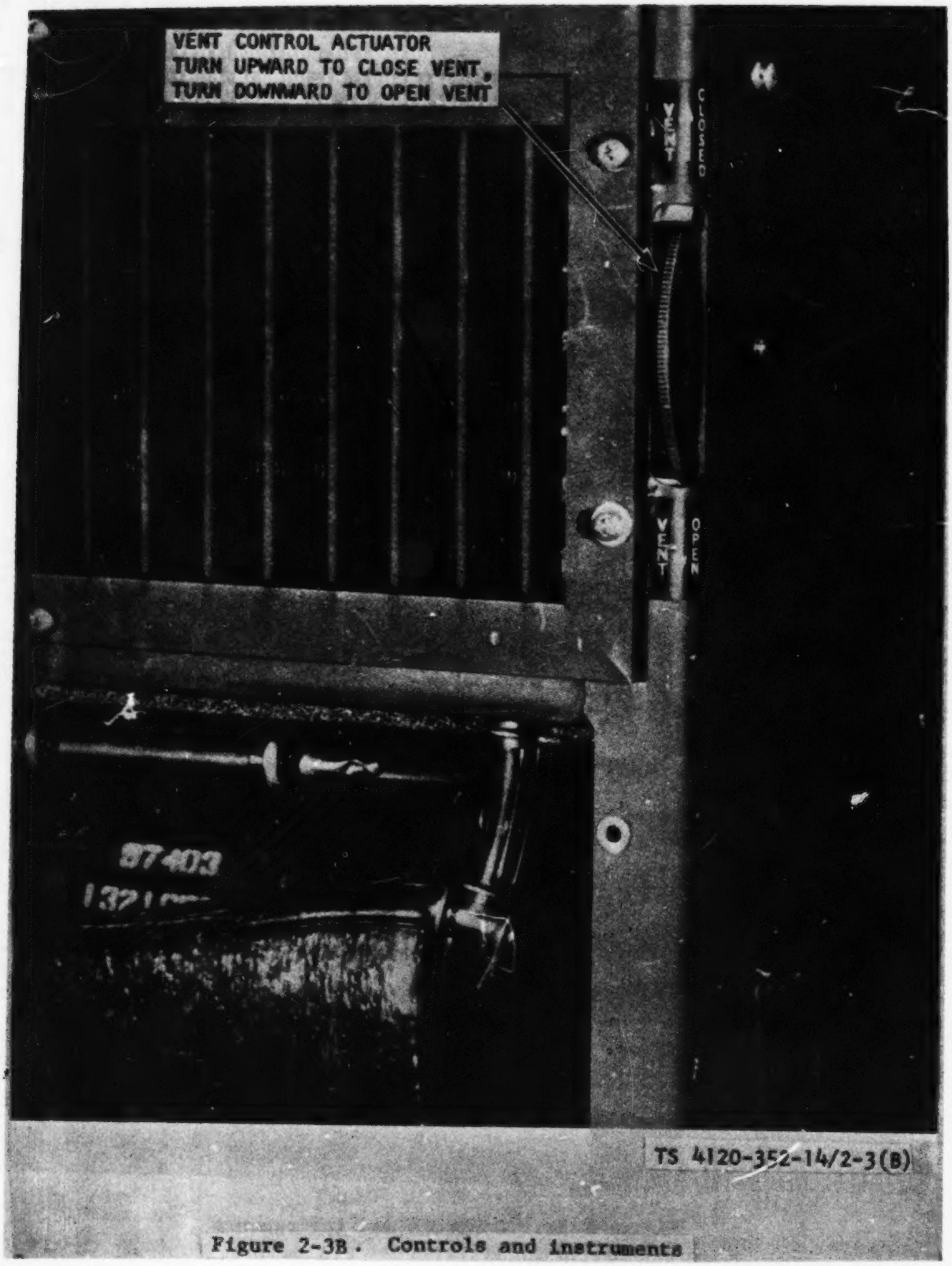

VENT CONTROL ACTUATOR
TURN UPWARD TO CLOSE VENT,
TURN DOWNWARD TO OPEN VENT
VENT
CLOSED
VENT
OPEN
87403
TS 4120-352-14/2-3(B)

Figure 2-3B. Controls and instruments

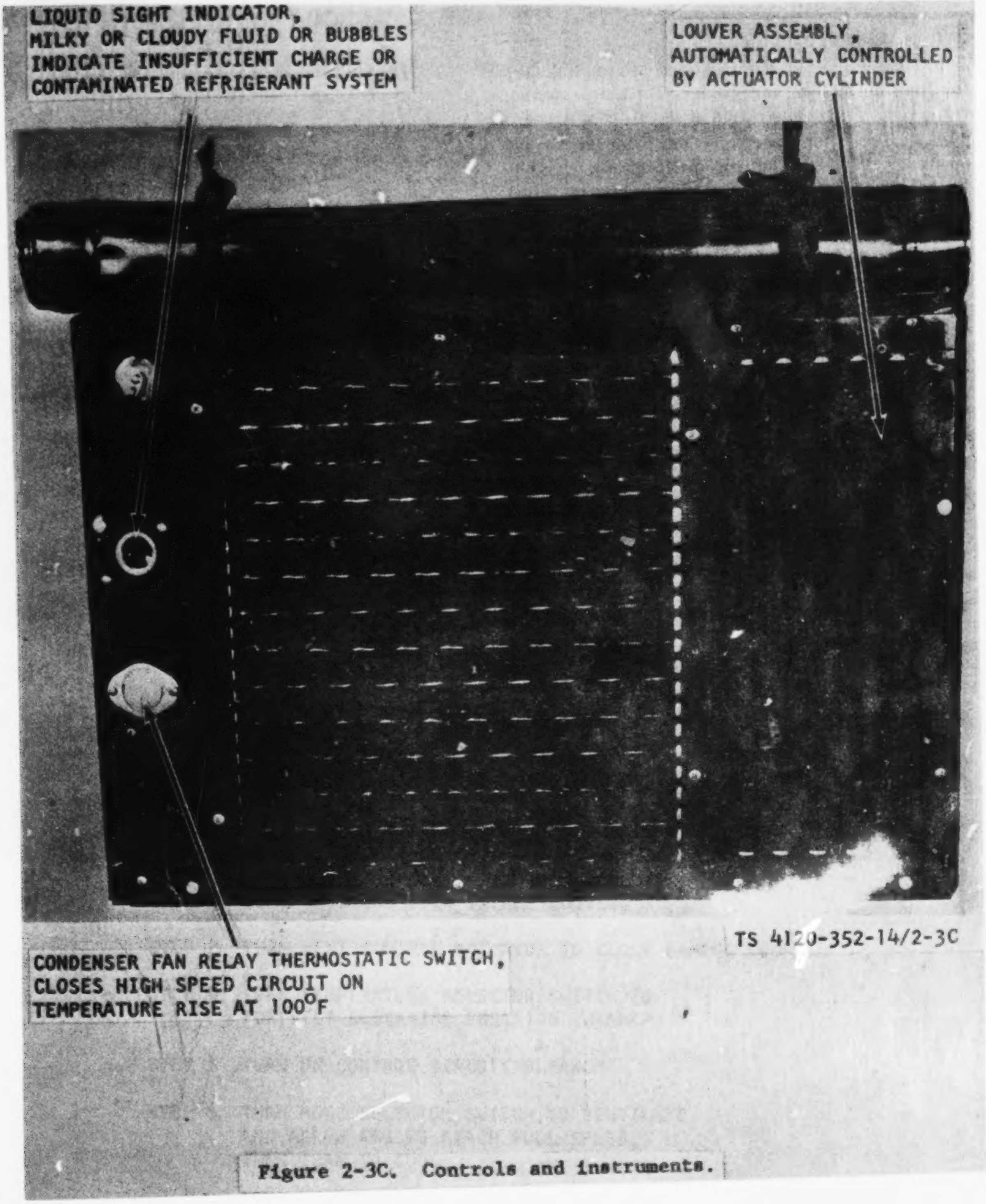

LIQUID SIGHT INDICATOR, MILKY OR CLOUDY FLUID OR BUBBLES INDICATE INSUFFICIENT CHARGE OR CONTAMINATED REFRIGERANT SYSTEM
LOUVER ASSEMBLY, AUTOMATICALLY CONTROLLED BY ACTUATOR CYLINDER
TS 4120-352-14/2-3C
CONDENSER FAN RELAY THERMOSTATIC SWITCH, CLOSES HIGH SPEED CIRCUIT ON TEMPERATURE RISE AT 100°F

Figure 2-3C. Controls and instruments.

Section III. OPERATION UNDER USUAL CONDITIONS

2-7. General

a. The instructions in this section are published for the information and guidance of the personnel responsible for the operation of the air conditioner.

b. The operator must know how to perform every operation of which the air conditioner is capable. This section gives instructions on starting and stopping the air conditioner, and detailed operating instructions. Since nearly every condition presents a different problem, the operator may have to vary the given procedure to fit the condition.

2-8 Starting and Operating Instructions.

a. Preparation for Starting.

(1) Perform the daily preventive maintenance service (para 3-4).

(2) Connect the main power cable.

(3) Check drain holes to insure that they are open.

(4) Be sure the unit is firmly secured.

(5) Roll up condenser cover and tie at top of air conditioner to clear condenser opening.

NOTE

When vent damper door is open to admit fresh air, partially close evaporator inlet louver to balance incoming air. Keep vent or damper door closed during heavy rain.

b. Starting Instructions for Cooling. Start the air conditioner for cooling as shown in figure 2-4.

c. Operating Instructions for Cooling. Operate the air conditioner for cooling as shown by figure 2-5.

d. Starting Instructions for Heating. Starting the air conditioner for heating is shown in figure 2-6.

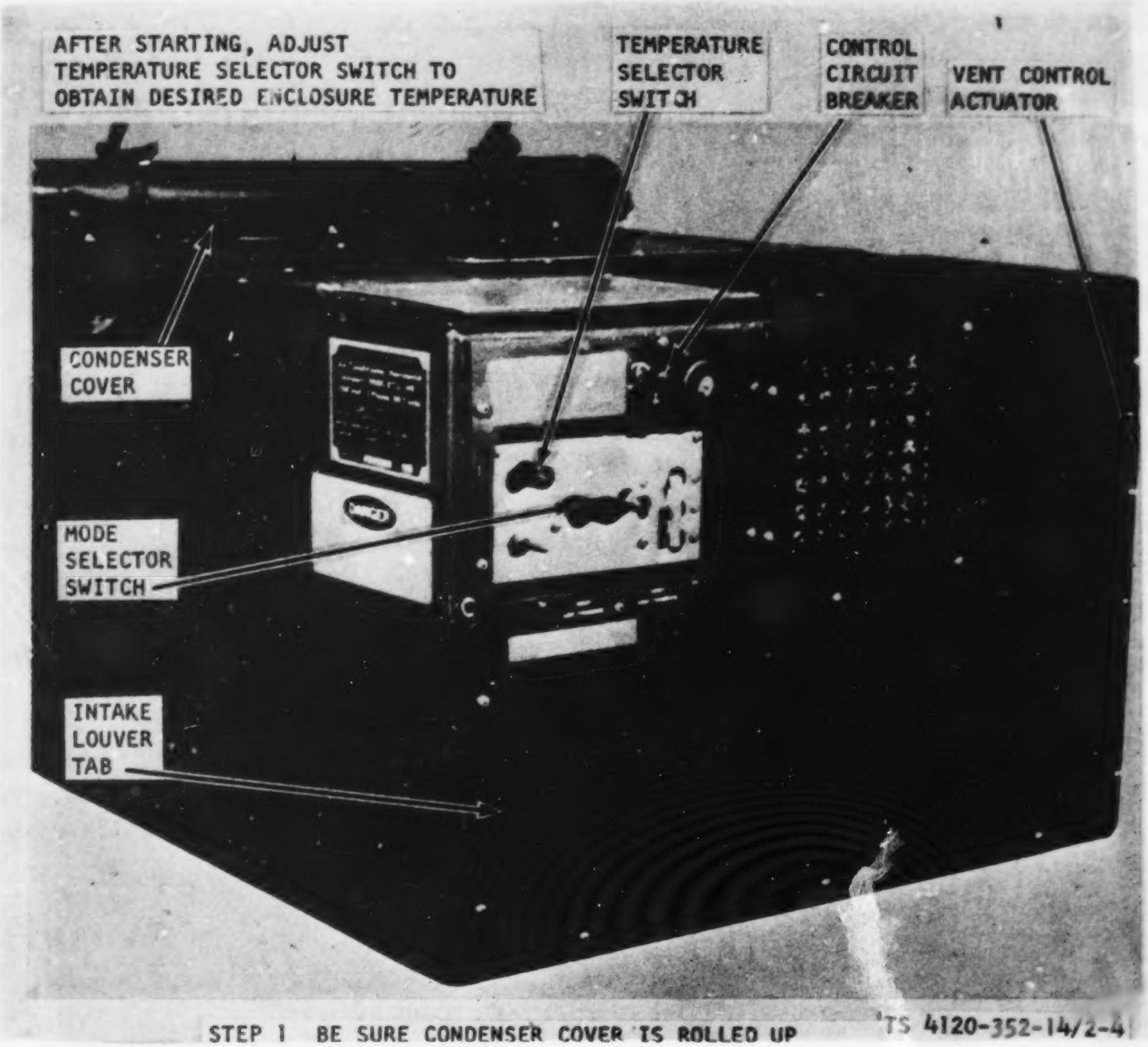
e. Operating Instructions for Heating. Operate the air conditioner for heating as shown in figure 2-7.

f. Operating Instructions for Ventilation. Operate the air conditioner for ventilation as shown by figue 2-8.

2-9. Stopping Instructions

a. Stop the air conditioner as shown by figure 2-9.

b. Perform the daily preventive maintenance service (para 3-4).


AFTER STARTING, ADJUST TEMPERATURE SELECTOR SWITCH TO OBTAIN DESIRED ENCLOSURE TEMPERATURE
TEMPERATURE SELECTOR SWITCH
CONTROL CIRCUIT BREAKER
VENT CONTROL ACTUATOR
CONDENSER COVER
MODE SELECTOR SWITCH
INTAKE LOUVER TAB
TS 4120-352-14/2-4

STEP 1 BE SURE CONDENSER COVER IS ROLLED UP

STEP 2 LIFT TABS AND OPEN INTAKE LOUVERS

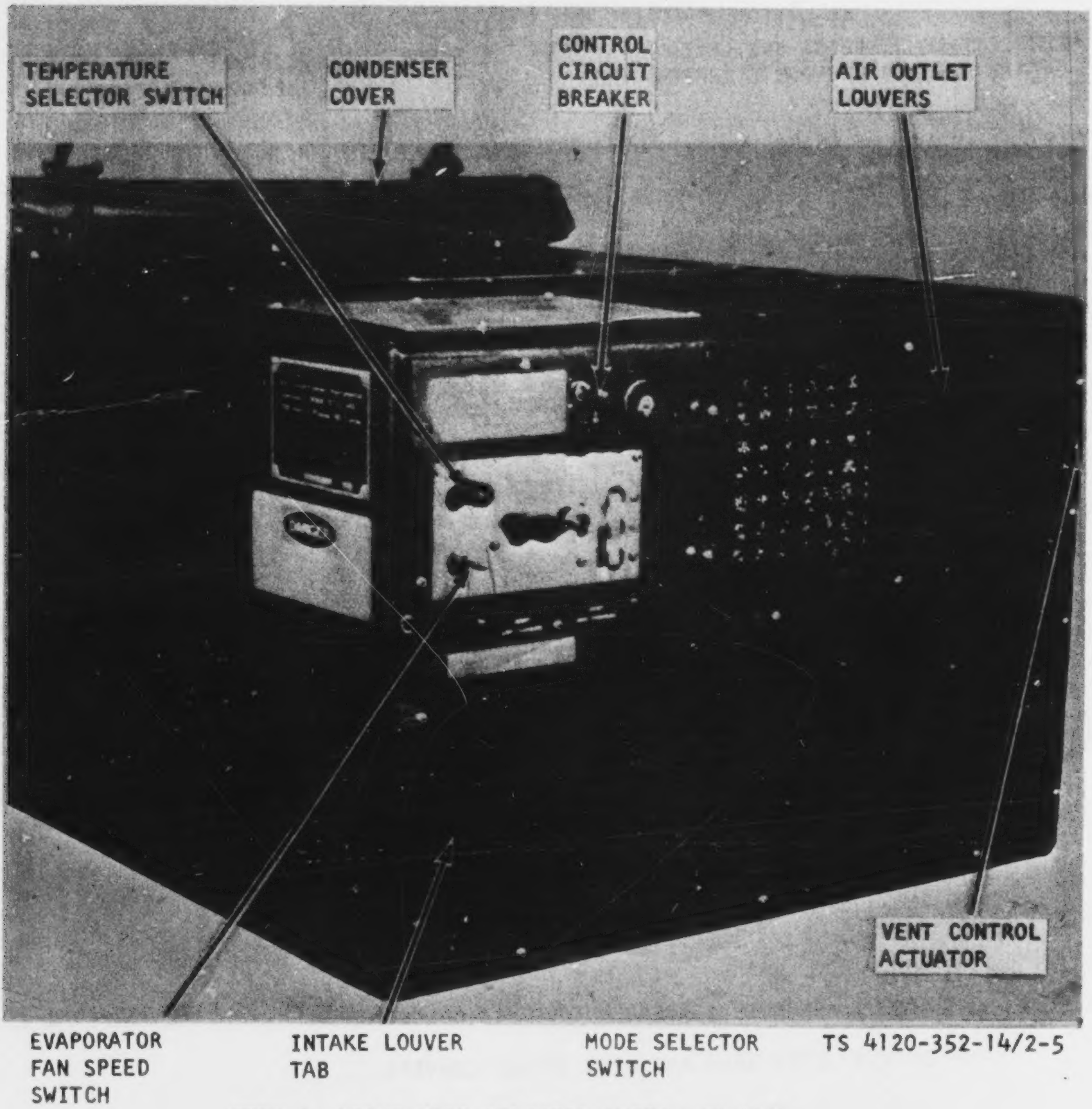
STEP 3 TURN VENT CONTROL ACTUATOR TO CLOSE DAMPER DOOR

STEP 4 TURN TEMPERATURE SELECTOR SWITCH TO FURTHEST CLOCKWISE POSITION (WARMER)

STEP 5 TURN ON CONTROL CIRCUIT BREAKER

STEP 6 TURN MODE SELECTOR SWITCH TO VENTILATE AND ALLOW FAN TO REACH FULL SPEED, THEN TURN TO COOL

Figure 2-4. Starting instructions for cooling.


TEMPERATURE SELECTOR SWITCH
CONDENSER COVER
CONTROL CIRCUIT BREAKER
AIR OUTLET LOUVERS
VENT CONTROL ACTUATOR
EVAPORATOR FAN SPEED SWITCH
INTAKE LOUVER TAB
MODE SELECTOR SWITCH
TS 4120-352-14/2-5

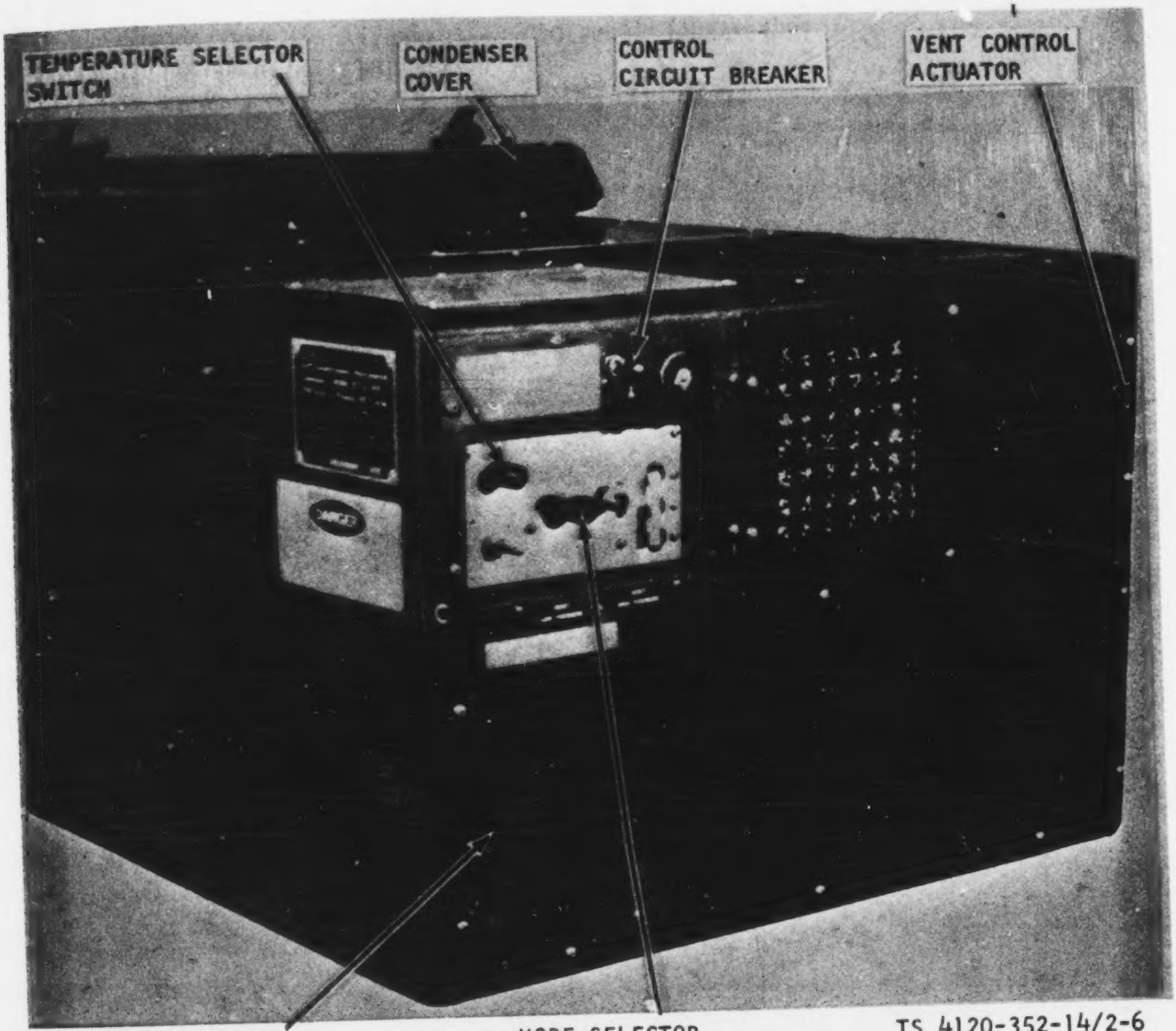
STEP 1 LEAVE MODE SELECTOR SWITCH ON COOL

STEP 2 ADJUST TEMPERATURE SELECTOR SWITCH TO DEGREE OF COOLING DESIRED

STEP 3 SET EVAPORATOR FAN SPEED SWITCH TO DESIRED POSITION

STEP 4 ADJUST AIR OUTLET LOUVERS TO DIRECT AIR FLOW AS DESIRED

Figure 2-5. Operating instructions for cooling.


TEMPERATURE SELECTOR SWITCH
CONDENSER COVER
CONTROL CIRCUIT BREAKER
VENT CONTROL ACTUATOR
INTAKE LOUVER TAB
MODE SELECTOR SWITCH

TS 4120-352-14/2-6

STEP 1 BE SURE CONDENSER COVER IS ROLLED UP

STEP 2 LIFT TABS AND OPEN INTAKE LOUVERS

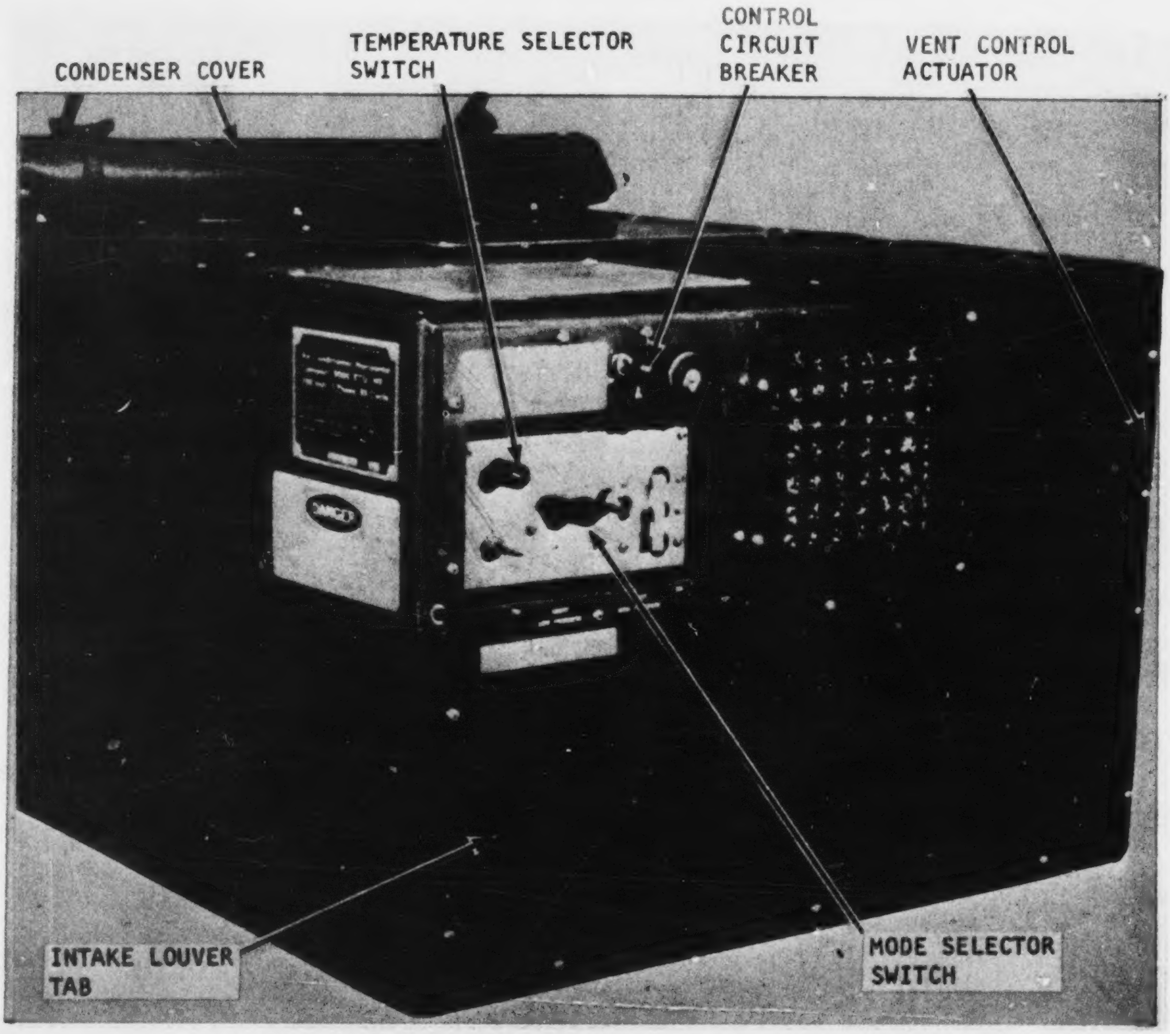
STEP 3 TURN VENT CONTROL ACTUATOR TO CLOSE DAMPER DOOR

STEP 4 TURN TEMPERATURE SELECTOR SWITCH TO FURTHEST COUNTERCLOCKWISE POSITION (COOLER)

STEP 5 TURN ON CONTROL CIRCUIT BREAKER

STEP 6 TURN MODE SELECTOR SWITCH TO LOW HEAT. TURN TO HIGH IF MORE HEAT IS DESIRED

Figure 2-6. Starting instructions for heating.


CONDENSER COVER
TEMPERATURE SELECTOR SWITCH
CONTROL CIRCUIT BREAKER
VENT CONTROL ACTUATOR
INTAKE LOUVER TAB
MODE SELECTOR SWITCH

TS 4120-352-14/2-7

NOTE: AFTER STARTING ADJUST TEMPERATURE SELECTOR SWITCH TO OBTAIN DESIRED ENCLOSURE TEMPERATURE

STEP 1 TURN VENT CONTROL ACTUATOR TO OPEN DAMPER DOOR

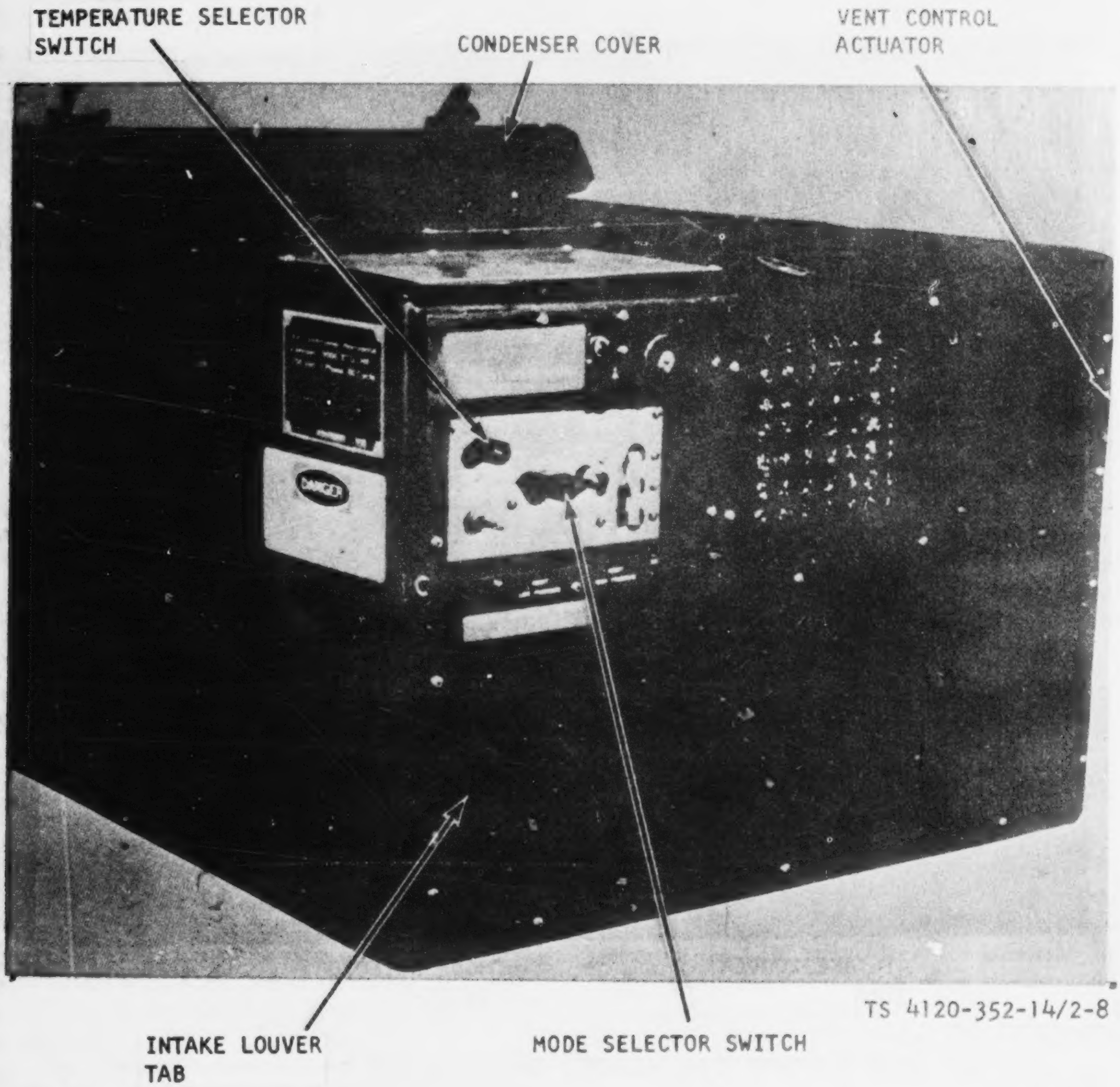
STEP 2 PARTIALLY CLOSE INTAKE LOUVER BLADES

STEP 3 TURN MODE SELECTOR SWITCH TO HIGH HEAT OR LOW HEAT

STEP 4 ADJUST TEMPERATURE SELECTOR SWITCH TO DESIRED ENCLOSURE TEMPERATURE

STEP 5 ADJUST AIR OUTLET LOUVERS TO DIRECT AIR FLOW AS DESIRED

Figure 2-7. Operating instructions for heating.


TEMPERATURE SELECTOR SWITCH
CONDENSER COVER
VENT CONTROL ACTUATOR
DANGER
TS 4120-352-14/2-8
INTAKE LOUVER TAB
MODE SELECTOR SWITCH

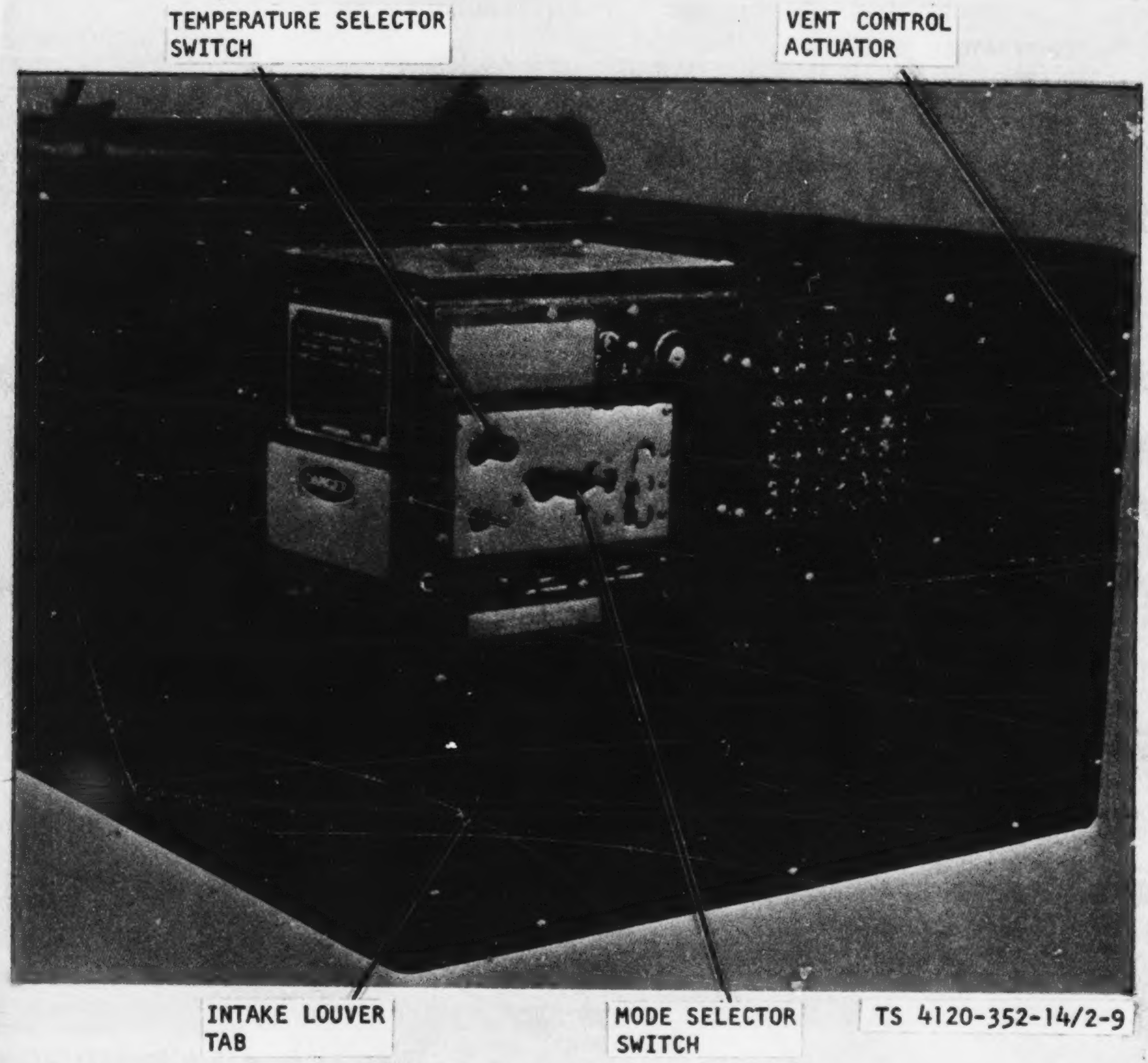
STEP 1 BE SURE CONDENSER COVER IS ROLLED UP

STEP 2 TURN VENT CONTROL ACTUATOR TO OPEN DAMPER DOOR

STEP 3 PARTIALLY CLOSE INTAKE LOUVERS

STEP 4 TURN MODE SELECTOR SWITCH TO VENTILATE

Figure 2-8. Operating instructions for ventilation.


TEMPERATURE SELECTOR SWITCH
VENT CONTROL ACTUATOR
INTAKE LOUVER TAB
MODE SELECTOR SWITCH

TS 4120-352-14/2-9

STEP 1 TURN MODE SELECTOR SWITCH TO OFF

STEP 2 CLOSE INTAKE LOUVERS

STEP 3 TURN ACTUATOR TO CLOSE FRESH AIR VENT DAMPER

NOTE: IF SHUTDOWN IS FOR AN EXTENDED PERIOD, COVER EVAPORATOR AND CONDENSER GRILLS AND DISCONNECT POWER CABLE

Figure 2-9. Air conditioner stopping instructions.

Section IV. OPERATION UNDER UNUSUAL CONDITIONS

2-10. Operation in Extreme Cold

a. General. The air conditioner is designed to operate on the heating cycle in ambient temperatures as low as minus 50°F (-45°C) and on cooling cycle with 0°F (-18°C) air entering the condenser and 70°F (21°C) air entering the evaporator.

b. Before Operation. Before starting on cooling cycle be sure cover is removed from condenser air intake and discharge. Clear all ice and snow from openings. Be sure all dampers are in operating condition.

c. After Operation. Install cover over condenser air intake and discharge openings.

CAUTION

Do not disturb wiring during cold weather unless absolutely necessary. Cold temperatures make wiring and insulation brittle and easily broken.

2-11. Operation in Extreme Heat

a. General. The air conditioner is designed to operate satisfactorily at temperatures up to plus 120°F (49°C). If unit is operated at condenser inlet temperatures higher than 120°F (49°C), the cooling capacity will be lowered, and long periods of operation at extended temperatures may cause condenser or condenser fan motor to overheat and trip their internal overload switches or the high pressure cutout switch will shut the unit off.

b. Filters. To maintain the highest capacity of the unit, the return air filter and fresh air screen should be cleaned weekly or more often if necessary. Dirty filters reduce the flow of air across the evaporator coil, thereby reducing the capacity of the air conditioner.

c. Guards and Louvers. Keep all guards and louvers clean and free of any obstructions to maintain full air flow through the air conditioner.

d. Coils. Clean evaporator and condenser coils as frequently as necessary to prevent dirt or other matter from obstructing the air flow.

2-12. Operation in Dusty or Sandy Areas

a. Protection. Shield the air conditioner from dust as much as possible. Take advantage of any natural barriers which offer protection.

b. Cleaning. Keep the air conditioner as clean as possible. Pay particular attention to the louvers, filters, coils, electrical components and grilles. Use compressed air, if available, to aid in cleaning.

c. Air Filters and Coils.

(1) Under extremely dusty or sandy conditions, the louvers, filters, coils, electrical components and grilles must be serviced more often.

NOTE

Never operate the unit without having the air filters in place.

(2) The condenser coil is subjected to ambient air. Therefore, it requires cleaning more often than the evaporator coil.

2-13. Operation Under Rainy or Humid Conditions

Take special precautions to keep equipment dry. If installed outdoors, cover the equipment with a waterproof cover when it is not in use. Remove cover during dry periods. Take all necessary precautions to keep the electrical components free from moisture.

WARNING

Make sure power is disconnected from air conditioner before touching any wiring or other electrical parts.

2-14. Operation in Salt Water Areas

a. General. Wash the exterior and condenser section of the unit, particularly condenser air discharge louver control mechanism, with clean fresh water at frequent intervals. Be careful not to damage electrical system with water. Special attention must be given to prevent rust and corrosion.

WARNING

Disconnect power source prior to washing the air conditioner.

b. Painting. Paint all exposed areas where paint has cracked, peeled, or blistered, or report condition to organizational maintenance. Coat all exposed areas of polished metal with a light coat of grease.

CHAPTER 3

OPERATOR/CREW MAINTENANCE INSTRUCTIONS

Section I. LUBRICATION INSTRUCTIONS

3-1. Fan Motors.

The evaporator and condenser motors are permanently lubricated by the manufacturer and require no additional lubrication.

3-2. Compressor.

The compressor and compressor motor are fully lubricated by the manufacturer and require no additional lubrication.

Section II. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

3-3. General.

To insure that the air conditioner is ready for operation at all times, it must be inspected systematically so that defects may be discovered and corrected before they result in serious damage or failure. The necessary preventive maintenance services to be performed are listed and described in paragraph 3-4. The item numbers indicate the sequence of minimum inspection requirements. Defects discovered during operation of the unit will be noted for future correction to be made as soon as operation of the unit has ceased. Stop operation immediately if a deficiency is noted during operation which would damage the equipment if operation were continued. All deficiences and shortcoming will be recorded, together with the corrective action taken, on DA Form 2404, at the eariliest possible opportunity.

3-4. Daily Preventive Maintenance Services.

This paragraph contains a tabulated listing of preventive maintenance services which must be performed by the operator. The item numbers are listed consecutively and indicate the sequence of minimum requirements. Refer to table 3-1 for the daily preventive maintenance services.

Table 3-1. Operator/Crew Preventive Maintenance Checks and Services

B - Before Operation *D - During Operation* *A - After Operation*

INTERVAL AND SEQUENCE NO.			ITEM TO BE INSPECTED	WORK TIME (M/H)
B	D	A	PROCEDURE	
1			CONDENSER COVER With cover rolled up for operation, check securing ties for damage.	0.05
2	4	7	DRAINS Inspect drains for obstruction to drainage. Remove obstructions	0.10
3			MAINT POWER RECEPTACLE CONNECTOR Check for secure power connection. Tighten if necessary	0.05
	5		LIQUID SIGHT INDICATOR Check for moisture and low refrigerant chage. Yellow indicates mositure; bubbles or milky appearance indicates low charge.	0.05
	6		AIR CONDITIONER OPERATION Check for abnormal operation, vibration, unusual noise, failure to respond to controls.	0.10

Section III. TROUBLESHOOTING

3-5. General.

This section contains information that is useful in diagnosing and correcting troubles which cause unsatisfactory operation or failure of the air conditioner.

3-6. Operator's Troubleshooting Chart.

Troubleshooting procedures for operator-crew are listed in table 3-2.

Table 3-2. Troubleshooting

Malfunction
  Test or Inspection
    Corrective Action

1. AIR CONDITIONER FAILS TO OPERATE

Step 1. Check to see if main power cord is plugged in.
  Connect power cable to receptacle (fig. 2-3, Sheet 1), supplying 208 VAC, 3 phase, 50-60 hz power.
Step 2. Check to see if compressor circuit breaker is in OFF position.
  Reset circuit breaker (fig. 2-3, Sheet 1).
Step 3. Check to see if mode selector switch is in OFF position.
  Turn selector switch to desired operation (fig. 2-3, Sheet 1).

2. INSUFFICIENT COOLING

Step 1. Check to see if mode selector switch is in proper position.
  Set switch to COOL (fig. 2-3, Sheet 1).
Step 2. Check to see if temperature selector switch is in correct position.
  Adjust setting to COOLER (fig. 2-3, Sheet 1).
Step 3. Check to see if sufficient air is passing over evaporator coil.
  Open evaporator inlet louvers (fig. 2-4). Remove any obstructions from evaporator inlet and outlet louvers.
Step 4. Check to see if too much outside air is entering unit.
  Close or adjust vent (fig. 2-3, Sheet 2).
Step 5. Check to see if the system contains sufficient refrigerant by inspecting liquid sight indicator (para 3-10).
  Report low refrigerant condition to direct support maintenance.
Step 6. Check to see if evaporator fan speed switch is set to LOW speed position.
  Reset switch to HIGH speed position (fig. 2-3, Sheet 1).
Step 7. Check to see if sufficient air is passing through condenser coil.
  Remove any obstructions from condenser fan inelt and outlet.

3. NO HEAT OR LOW CAPACITY HEAT

Step 1. Check to see if mode selector switch is properly set.
  Set switch to LOW HEAT or HIGH HEAT (fig. 2-3 Sheet 1).
Step 2. Check to see if temperature selector switch is set correctly.
  Adjust to WARMER setting (fig. 2-3, Sheet 1).
Step 3. Check for insufficient air movement over heaters.
  Remove any obstructions from evaporator air intake and discharge louvers. Make sure intake louvers are open (fig. 2-3, Sheet 2).

Section IV. OPERATOR'S MAINTENANCE OF AIR CONDITIONER

3-7. General.

This section contains maintenance procedures for the operator of the air conditioner.

3-8. Screen.

Remove any obstructions. Brush off loose dirt and wipe clean.

3-9. Drains.

Clean out drain openings and remove any obstructions.

3-10. Liquid Sight Indicator.

Wipe refrigerant liquid sight indicator glass with a soft clean cloth. Set controls at cool-cooler and operate unit for 15 minutes before observation. Yellow appearance indicates moisture in system and bubbles or milky flow indicates low refrigerant charge. Report presence of these conditions to direct support maintenance.

CHAPTER 4

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF MATERIAL

4-1. General.

Instructions for unloading, unpacking and installing the air conditioner are covered in paragraphs 2-1, 2-2, and 2-4.

4-2. Inspecting and Servicing Equipment.

a. Inspection. General inspection of the equipment is covered in paragraph 2-3. If possible damage has occurred, requiring removal of covers or other components not authorized for removal by the operator, further inspection of internal components is to be performed by organizational maintenance personnel. If other than new equipment has been received, a thorough inspection is to be performed.

b. Servicing. Remove and inspect return air filter and fresh air screen, and service filter and screen if necessary.

4-3. Installation.

Check air conditioner for proper installation. If auxiliary power connection is to be used, change leads as shown on schematic diagram, figure 2-4.

Section II. MOVEMENT TO A NEW WORKSITE

Not applicable.

Section III. REPAIR PARTS, SPECIAL TOOLS AND EQUIPMENT

4-4. Tools and Equipment.

No tools or equipment are issued with the air conditioner.

4-5. Special Tools and Equipment.

No special tools or equipment are required for maintenance of the air conditioner.

4-6. Maintenance Repair Parts.

Repair parts and equipment are listed and illustrated in the repair parts and special tool list covering organizational maintenance for this equipment. (TM 5-4120-352-24P).

Section IV. LUBRICATION

4-7. Fan Motors.

The evaporator fan and condenser fan motors are permanently lubricated by the manufacturer and require no additional lubrication.

4-8. Compressor.

The compressor and compressor motor are fully lubricated by the manufacturer and require no additional lubrication.

Section V. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

4-9. General.

Periodic maintenance checks are required by organizational maintenance personnel to check the performance of daily preventive maintenance services. Additional periodic maintenance services are required that are beyond the scope of the Operator's maintenance.

4-10. Quarterly Preventive Maintenance Services.

a. This paragraph contains a tabulated listing of preventive maintenance services which must be performed by organizational maintenance personnel at quarterly intervals. A quarterly interval is equal to three calendar months, or 250 hours of operation, whichever occurs first.

b. The item numbers are listed consecutively and indicate the sequence of inspection and minimum requirements. Refer to table 4-1 for quarterly preventive maintenance services.

c. Some services are required at a shorter interval and are so noted. Service intervals should be shortened under extreme or unusual conditions.

Section VI. TROUBLESHOOTING

4-11. General.

This section contains troubleshooting instructions for the isolation of causes and common troubles that may occur during operation, and also gives the possible remedies to correct the trouble.

4-12. Organizational Troubleshooting Chart.

a. General. Troubleshooting procedures for organizational maintenance personnel are listed in table 4-2. As shown in the table, troubleshooting begins by identifying the malfunction. Next, suitable tests or inspections are made in step-by-step order. Finally, a corrective action is given. Remedies beyond the scope of organizational maintenance must be reported to direct support maintenance personnel. Additional procedures are given in paragraph (b) and (c) which follow.

b. Control Circuit. The cause for the failure of the system to operate can be narrowed to a specific portion of the sytem if the control component associated with the failure can be isolated. It is the purpose of safety devices to open the circuit under certain overload or fault conditions. If a safety device is open, additional checking is required to determine if the open is due to a faulty safety device or if the safety device is performing its intended function, and the fault is located elsewhere in the system. To check the control circuit, proceed as follows.

(1) Disconnect air conditioner from source of power.

(2) Using a series test lamp or ohmmeter, check the continuity through each control in the affected circuit with the control in the closed position, while being checked. Use the system schematic and wiring diagrams for point-to-point circuit tracing.

(3) Replace each defective part with a serviceable like item.

c. Safety Devices. When testing the control circuit and associated components, take into account the normal state of the safety device. Determine (1) whether it is normal for the device to be open under the existing conditions or (2) if the open condition indicates trouble elsewhere in the air conditioner.

Table 4-1. Organizational Preventive Maintenance Checks and Services

Q - Quarterly
Total Man-Hours Required: 3.50

W - Weekly
Total Man-Hours Required: 0.40

SEQUENCE NO. Q	SEQUENCE NO. W	ITEM TO BE INSPECTED PROCEDURE	WORK TIME (M/H)
	1	AIR FILTER AND MIST ELIMINATOR Inspect and service of replace as necessary (para 4-17).	0.30
	2	FRESH AIR SCREEN Inspect and clean or replace as necessary (para 4-19).	0.10
3		EVAPORATOR COIL Clean and inspect (para 4-24).	0.50
4		CONDENSER COIL Clean and inspect (para 4-23).	0.50
5		HOUSING COVERS Repair or replace damaged covers (para 4-21).	0.50
6		WIRING AND ELECTRICAL COMPONENTS Check for damaged or frayed wiring. Check for defective electrical components. Repair or replace defective wiring. Replace defective electrical components (para 4-33).	0.50
7		REFRIGERATION SYSTEM Check compressor, valves and piping for damage. Report damage to direct support maintenance.	0.50

Table 4-2. Troubleshooting

Malfunction
Test or Inspection
Corrective Action

---

1. AIR CONDITIONER FAILS TO OPERATE

Step 1. Check to see if main power cable is connected.
Connect cable to power source.
Step 2. Check to see if main power receptacle is defective.
Tighten loose connections.
Step 4. Check to see if mode selector rotary switch is improperly positioned or is defective.
Turn selector to COOL or VENT. Replace switch if defective (para 4-42).
Step 5. Check to see if control circuit breaker or compressor circuit breaker is in OFF position or is defective.
Reset circuit breaker(s) or replace defective circuit breaker (para 4-42).
Step 6. Test control circuit transformer and retctifier for faulty operation.
Replace defective transformer and/or rectifier (para 4-45 and 4-46).

2. INSUFFICIENT COOLING

Step 1. Check to see if the mode selector switch is improperly positioned.
Set switch to COOL.
Step 2. Check to see if temperature selector control is improperly positioned or is defective.
Adjust setting or replace swithc (para 4-42).
Step 3. Check to see if fresh air damper control is incorrectly set or improperly adjusted.
Verify setting and, if necessary, correct adjustment of damper control (para 4-27).
Step 4. Check to see if evaporator outlet louver is bent of stuck in closed position.
Repair or replace louver (para 4-18).
Step 5. Inspect condenser coil for dirt accumulation.
Clean coil (para 4-23).
Step 6. Inspect evaporator return air filter for dirt accumulation.
Clean filter (para 4-17).
Step 7. Check to see if evaporator fan is loose or defective.
Tighten if loose or replace if defective.
Step 8. Check evaporator fan motor for a defective thermal protective device.
Replace thermal protector (para 4-39).
Step 9. Check to see if evaporator fan motor is worn or defective.
Report deficiency to direct support maintenance or replace motor (para 4-38 and 4-40).
Step 10. Test refrigerant system for insufficient charge by inspecting liquid sight indicator.
Report low-charge condition to direct support maintenance.
Step 11. Check compressor for defective operation.
Report condition to general support maintenance

3. EVAPORATOR OR CONDENSER FAN FAILS TO OPERATE

Step 1. Check to see if main power cable is connected.
Connect cable to power source.
Step 2. Check to see if main power receptacle or plug connectors are defective.
Replace connectors or receptacle (para 4-33).
Step 3. Check to see if mode selector rotary switch is improperly adjusted or is defective.
Replace switch if defective (para 4-42).
Step 4. Check to see if evaporator fan speed control switch is defective.
Replace defective swithc (para 4-42).
Step 5. Check to see if condenser fan motor thermal protector is defective.
Replace defective thermal protector (para 4-39).
Step 6. Check to see if evaporator fan motor thermal protector is defective.
Replace defective thermal protector (para 4-39).

Table 4-2. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

---

3. EVAPORATOR OR CONDENSER FAN FAILS TO OPERATE (CONT)

Step 7. Check to see if evaporator fan or condenser fan is defective or binding.
Relieve binding or replace fan (para 4-43).

Step 8. Check to see if condenser fan high-low thermostatic switch is defective.
Replace defective thermostatic switch (para 4-41).

Step 9. Test condenser fan relay for defective operation.
Replace defective relay (para 4-43).

Step 10. Test evaporator fan motor and condenser fan motor for defective operation.
Replace defective fan motor (para 4-38 and 4-40).

4. COMPRESSOR WILL NOT START

Step 1. Check to see if compressor or control circuit breakers or selector swithch is improperly set.
Reset controls properly.

Step 2. Check for defective or tripped compressor internal temperatur overload switch.
Allow unit to cool. If condition continues, report deficiency to direct support maintenance.

Step 3. Check for loose electrical connections or faulty wiring.
Tighten loose connections. Repair faulty wiring.

Step 4. Test for open control circuit by means of continuity check (para 4-12).
Report open-circuit condition to direct support maintenance.

Step 5. Check to see if contacts on high or low pressure cutout switch are open.
Reset pressure switches. If condition continues, report deficiency to direct support maintenance.

Step 6. Test control circuit breaker and compressor circuit breaker for faulty operation.
Replace defective circuit breaker (para 4-44 thru 4-48 or 4-50 thru 4-54).

Step 7. Test control transformer and rectifier for defective operation.
Replace defective transformer (para 4-45 and defective rectifier (para 4-46).

Step 8. Test for defective time delay relay.
Replace defective realay (para 4-43).

Step 9. Test for defective compressor relay.
Replace defective relay (para 4-43).

Step 10. Check to see if compressor motor is defective.
Report motor-fault condition to direct field maintenance.

5. COMPRESSOR STARTS BUT CUTS OUT ON OVERLOAD

Step 1. Check to see if evaporator fan speed switch is set at LOW speed.
Reset switch to HIGH speed.

Step 2. Check for defective or tripped compressor internal temperature overload switch.
Allow unit to cool. If condition condtinues, report deficiency to direct support maintenance.

Step 3. Check for high pressure due to improper condenser coil airflow.
Clean condenser coil and louvers. Verify proper operation of condenser fan.

Step 4. Check for improperly adjusted or defective refrigerant control valves.
Report condition to direct support maintenance.

Step 5. Test condenser fan for motor failure.
Replace defective motor (para 4-38 and 4-40).

Table 4-2. Troubleshooting (Cont)

Malfunction
Test or Inspection
Corrective Action

---

6. EVAPORATOR AIR OUTPUT VOLUME LOW

Step 1. Check to see if evaporator fan speed switch is set at low speed.
Reset switch to HIGH speed.

Step 2. Check for dirty or damaged filter or louvers.
Clean or replace filter (para 4-17). Clean or replace louvers, as required (para 4-18).

Step 3. Check for iced or dirty evaporator coil.
De-ice and clean coil (para 4-24).

Step 4. Inspect evaporator fan for defect.
Replace defective fan.

Step 5. Test fan motor for faulty operation.
Replace motor (para 4-38 and 4-40).

7. CONDENSER AIR OUTPUT VOLUME LOW

Step 1. Check for dirty condenser coil or guard.
Clean coil and guard (para 4-23).

Step 2. Check to see if air outlet louvers are stuck in closed position.
Free louvers and control cable. Adjust control, or notify direct support maintenance if actuating cylinder is not functioning properly.

Step 3. Check for defective HIGH-LOW condenser fan thermostatic switch.
Replace switch (para 4-41).

Step 4. Inspect for defective condenser fan.
Replace fan.

Step 5. Test for defective fan motor.
Replace motor (para 4-38 and 4-40).

8. AIR CONDITIONER FAILS TO HEAT

Step 1. Check to see if mode selector switch is improperly adjusted.
Reset selector to LOW heat or HIGH heat.

Step 2. Check to see if temperature selector control is set incorrectly.
Adjust control to WARMER.

Step 3. Inspect evaporator return air filter for dirty condition.
Clean filter (para 4-17).

Step 4. Inspect for defective temperature selector switch or mode selector switch.
Replace defective switch (para 4-42).

Step 5. Inspect for defective heater high temperature cutout thermostatic switch.
Replace defective thermostatic switch (para 4-34).

Step 6. Test for defective heater relay.
Replace defective relay (para 4-43).

Step 7. Inspect and test for defective heaters and associated wiring.
Tighten connections and repair damaged wiring. Replace defective heaters (para 4-35).

Step 8. Test for defective evaporator fan motor.
Replace motor (para 4-38 and 4-40).

Table 4-2. Troubleshooting (Cont)

Malfunction
    Test or Inspection
        Corrective Action

---

9. EXCESSIVE NOISE

Step 1. Check evaporator fan or condenser fan for loose blade or loose mountings.
    Tighten fan blade on motor shaft. Tighten all mounting hardware.

Step 2. Test for defective or worn evaporator or condenser fan motor.
    Replace worn or defective motor (para 4-38 and 4-40).

Step 3. Check to see if compressor motor (para 4-38 and 4-40).
    Stop air conditioner and report condition to direct support maintenance.

Section VII. RADIO INTERFERENCE SUPPRESSION

4-13. General Methods Used to Attain Proper Suppression.

Essentially, suppression is attained by providing a low resistance path to ground for the stray currents. Methods used include shielding ignition and high frequency wires, grounding the frame with bonding straps and using capacitors and resistors.

4-14. Interference Suppression Components.

The control module, junction box and electrical system components are grounded to the housing. the housing is connected to a ground wire in the power source. Capacitors (fig. 4-1) are located across the rectifier terminals.

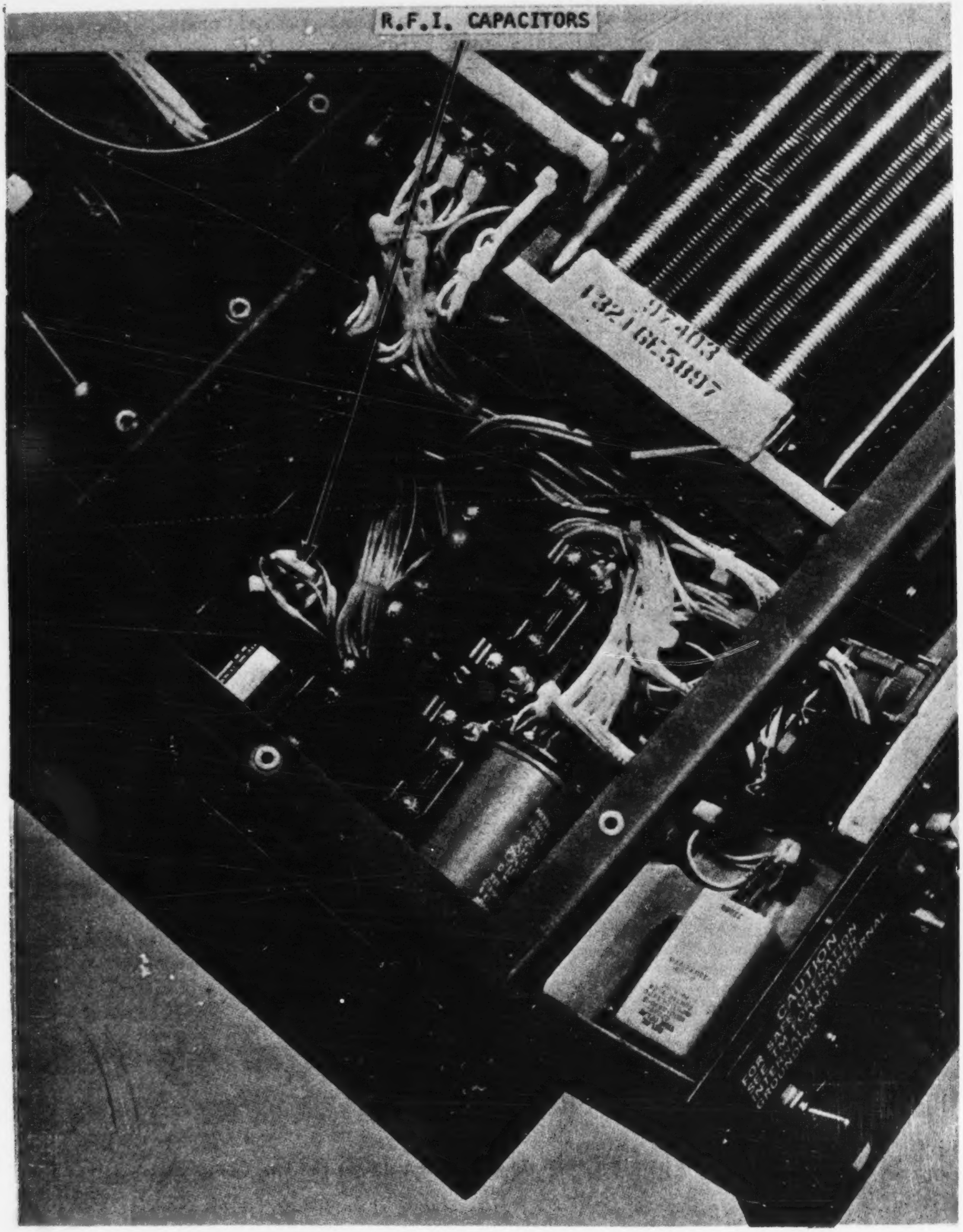
4-15. Replacement of Capacitor.

a. Removal.

(1) Remove front top cover of air conditioner.

(2) Remove 7 screws and lockwashers from front of control module assembly. Pull control module assembly forward as far as allowed by attached wires.

(3) Disconnect capacitor (fig. 4-1 from terminals 1 and 3 or 2 and 4 of rectifier.


R.F.I. CAPACITORS
97403
13216E5897
CAUTION

TS 4120-352-14/4-1

Figure 4-1. R. F. I. Capacitors.

*b. **Installation.*** Connect new capacitor across terminals 1 and 3 or 2 and 4 of rectifier as required, and install control module assembly and top front cover.

Section VIII. MAINTENANCE OF COVERS, LOUVERS and FILTERS

4-16. General.

This section covers the evaporator louvers, return air filter, condenser louvers, fresh air screen, and the top covers of the housing. These parts must be serviced regularly or removed frequently to gain access to parts of the air conditioner. For ease of reference these parts are covered in separate paragraphs in this section.

4-17. Servicing Return Air Filter and Mist Eliminator.

*a. **General.*** The return air filter (fig. 4-2), mounted in clips on the inner side of the inlet louver, filters the air returning to the air conditioner from the conditioned area. The mist eliminator (fig. 4-2) is mounted to the air discharge side of the evaporator coil in a location such as to remove airborne water droplets from the cooling airflow.

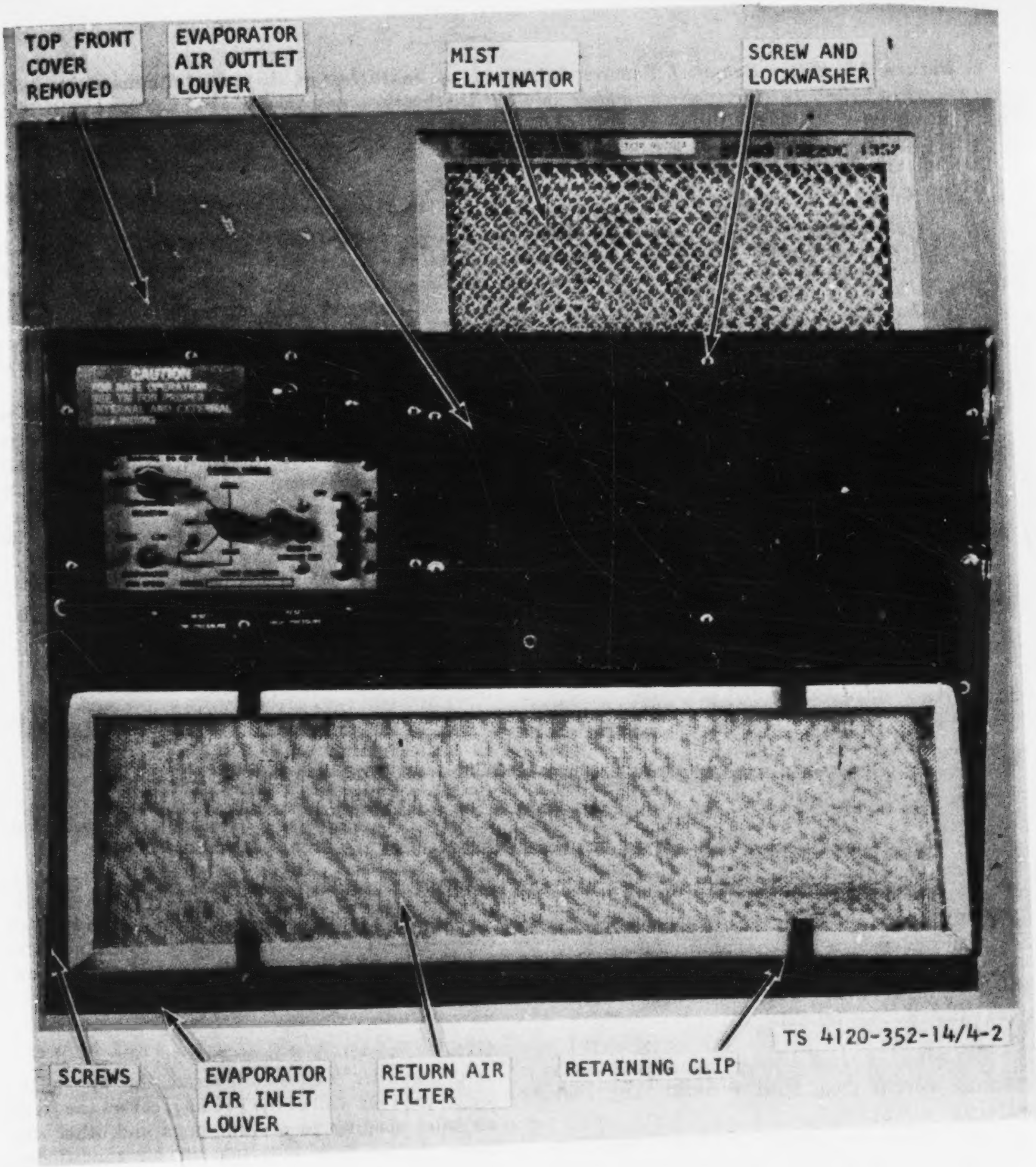

TOP FRONT COVER REMOVED
EVAPORATOR AIR OUTLET LOUVER
MIST ELIMINATOR
SCREW AND LOCKWASHER
CAUTION
TS 4120-352-14/4-2
SCREWS
EVAPORATOR AIR INLET LOUVER
RETURN AIR FILTER
RETAINING CLIP

Figure 4-2. Evaporator air inlet louvers, return air filter, and mist eliminator.

b. Return Air Filter Removal. Remove eight screws and lockwashers and remove evaporator air inlet louver (fig. 4-2). Slide return air filter from retaining clips on louver.

c. Cleaning and Inspection. Clean and inspect air filter as follows:

WARNING

Dry cleaning solvent, P-D-680, used to clean parts, is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100° - 138° F (38° - 59° C).

(1) Wash filter in detergent and water solution or cleaning solvent (Fed. Spec. P-D-680). Dry thoroughly.

(2) Inspect filter for damage or clogged condition. Replace filter if damaged or clogged.

(3) Oil filter with SAE 30 oil. Drain eight hours and wipe off excess oil.

d. Installation. Slide filter into air inlet louver and secure louver to housing with eight screws and lockwashers.

e. Mist Eliminator Removal. Refer to figure 405 and remove the top front cover. Slide the mist eliminator (figure 4-2) from its holder.

f. Cleaning and Inspection. Clean and inspect the mist eliminator as follows:

WARNING

Dry cleaning solvent, P-D-680, used to clean parts, is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100° - 138° F (38° -59° C).

(1) Wash in detergent and water solution or cleaning solvent (Fed. Sped. P-D-680). Dry thoroughly.

(2) Inspect for damaged or clogged condition. Replace if damaged or if clogged condition is not corrected by cleaning.

g. Installation. Slide mist eliminator into holding bracket, and install air conditioner top front cover.

4-18. Evaporator Air Inlet and Outlet Louvers.

a. General. The evaporator air inlet louver is adjustable to control the amount of return air that will pass through the air conditioner when the fresh air ventilation damper is open. The evaporator air outlet louver, mounted in front of the evaporator coil, has individually adjustable blades to direct the evaporator air outlet flow.

b. Removal. Refer to figure 4-2 and remove eight screws and lockwashers, and remove the evaporator air inlet louver. Remove the evaporator air outlet filter by removing six screws and lockwashers.

c. Cleaning, Inspection and Repair. Clean, inspect and repair louvers as follows:

WARNING

Dry cleaning solvent, P-D-680, used to clean parts, is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100° - 138° F (38° -59° C).

(1) Clean louvers with cleaning solvent (Fed. Spec. P-D-680).

(2) Inspect for bent or broken louver blades. Straighten bent blades. Replace louver if damaged.

d. Installation. Refer to figure 4-2, and install the air inlet louver, using eight screws and lockwashers. Install outlet louver over discharge opening, using six screws and lockwashers.

4-19. Fresh Air Screen.

a. General. The fresh air screen (fig. 4-3) mounted on the rear wall of the housing, covers the fresh air inlet opening to prevent bugs and other airborne matter from entering the air conditioner. This unit is designed for use with CBR.

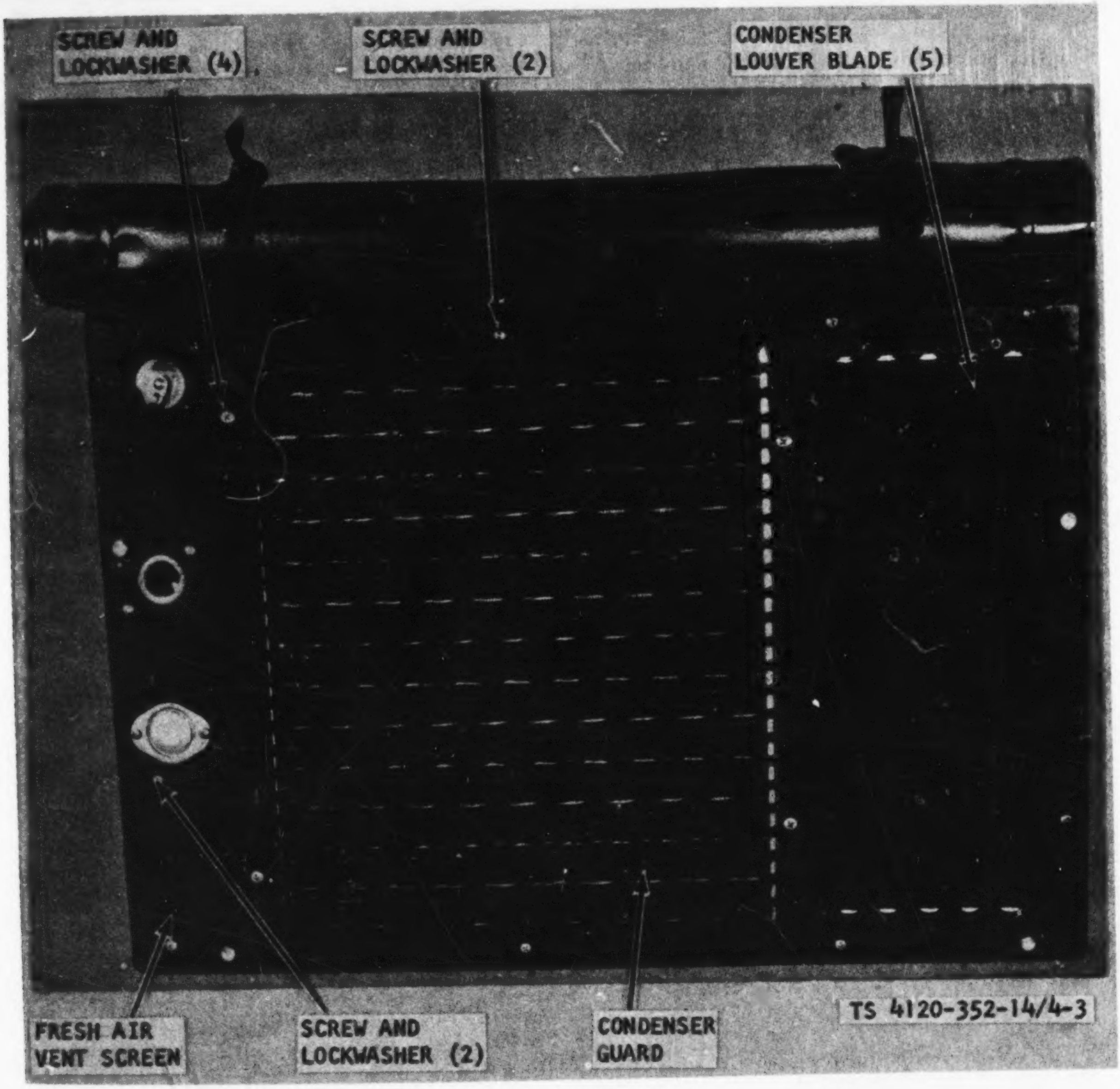

SCREW AND
LOCKWASHER (4)
SCREW AND
LOCKWASHER (2)
CONDENSER
LOUVER BLADE (5)
FRESH AIR
VENT SCREEN
SCREW AND
LOCKWASHER (2)
CONDENSER
GUARD
TS 4120-352-14/4-3

Figure 4-3. Fresh air vent screen, condenser guard and condenser louver blades.

b. Removal. Refer to figure 4-3. Remove two screws and lock washers and fresh air screen.

WARNING

Dry cleaning solvent, P-D-680, used to clean parts, is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100° - 138° F (38° -59° C).

c. Cleaning and Inspection. Clean the screen in cleaning solvent (Fed. Spec. P-D-680). Replace the screen if damaged or broken.

d. Installation. Refer to figure 4-3 and install the screen and two screws and lockwashers.

4-20 Condenser Guard and Louver.

a. General. The conedenser guard (fig. 4-3), located at the rear of the air conditioner, is an expanded metal guard that protects the condenser coil from damage. The condenser air discharge louver is opened and closed automatically by an actuator cylinder in the refrigeration system. A push-pull control assembly connects the louver and cylinder.

b. Cleaning and Inspection. The guard can be cleaned with a bristle brush without removing the guard from the air conditioner or the guard can be removed and washed thoroughly. Clean the louvers with a dry cloth. Inspect louver blades for bent condition or damaged rubber strips. Inspect guard for bent or broken condition.

c. Condenser Guard Removal and Installation. Refer to figure 4-3 and remove and install condenser guard as follows:

(1) Remove two screws and lockwashers from top and bottom of guard.

(2) Remove four screws and lockwashers that secure guard to condenser coil. Remove guard.

(3) Install guard and six screws and lockwashers previously removed.

d. Replacement of Louver Blades. Individual condenser louver blades (fig. 4-3) are flexible enough for removal. Remove damaged blades as follows:

(1) Remove rear cover as described in paragraph 4-21.

(2) Remove push-on type nut (fig. 4-4) from louver blades to be removed. Flex blade to remove ends from bearings and remove blade.

(3) Flex new blade in same manner as in removal and install ends in bearings.

(4) Install push-on nut.

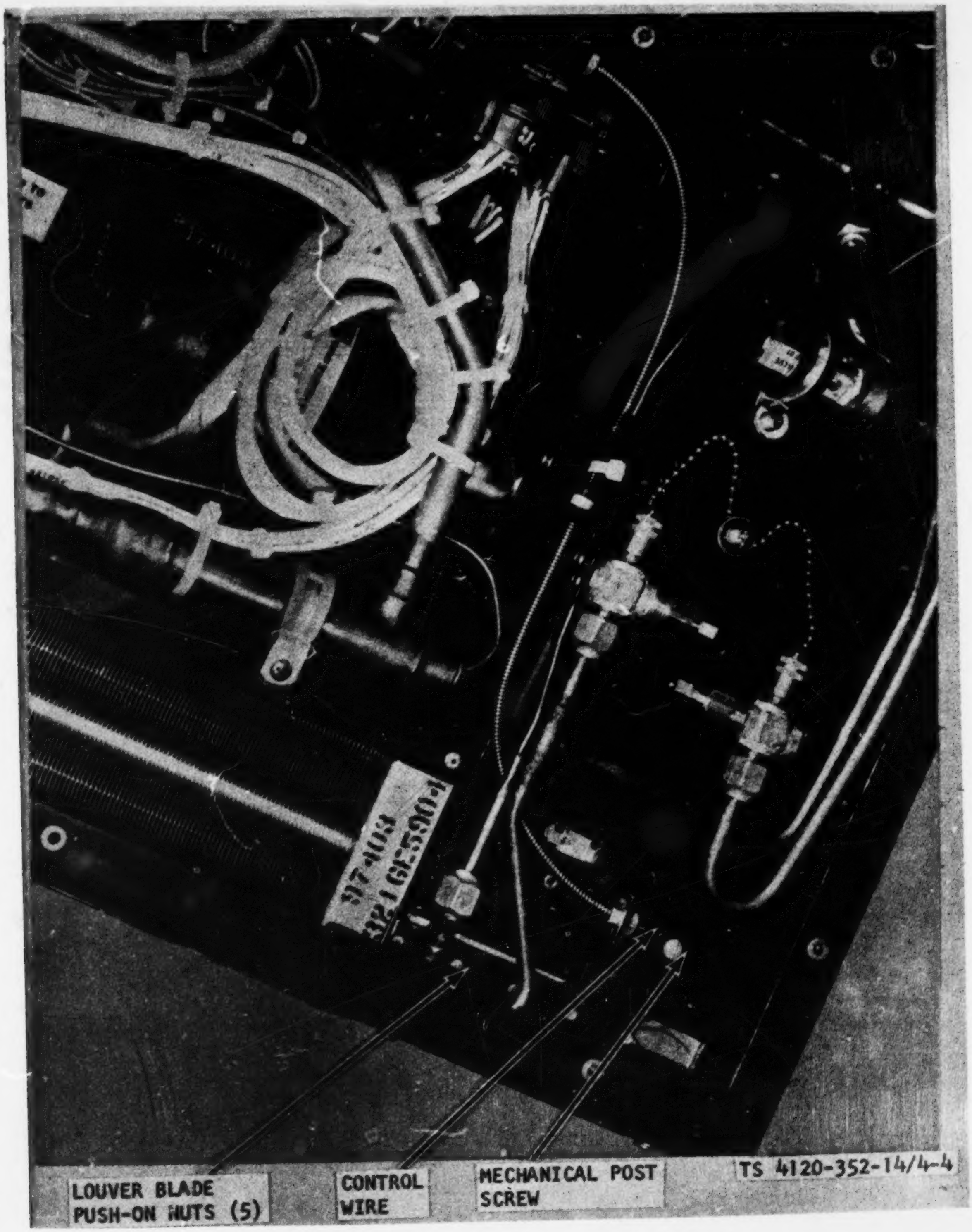

LOUVER BLADE PUSH-ON NUTS (5)
CONTROL WIRE
MECHANICAL POST SCREW
TS 4120-352-14/4-4

Figure 4-4. Louver blade push-on nuts and louver control attachment.

e. Condenser Louver Control Adjustment. To adjust the louver control with refrigerant in the system, proceed as follows:

(1) Turn off air conditioner and wait four hours or until air conditioner is uniformly at ambient temperature.

(2) Loosen mechanical post screw (fig. 4-4). Close condenser louvers, pull wire tight and tighten mechanical post screw. Louvers must be tightly closed when air conditioner is off.

4-21. Housing Covers.

a. General. The top of the housing is enclosed by front, center and rear covers. The rear cover has an access opening over the charging valves. This opening is coved by an access cover during normal operation. A canvas cover, mounted on the rear cover, is used to cover the condenser and fresh air openings when the air conditioner is not in use.

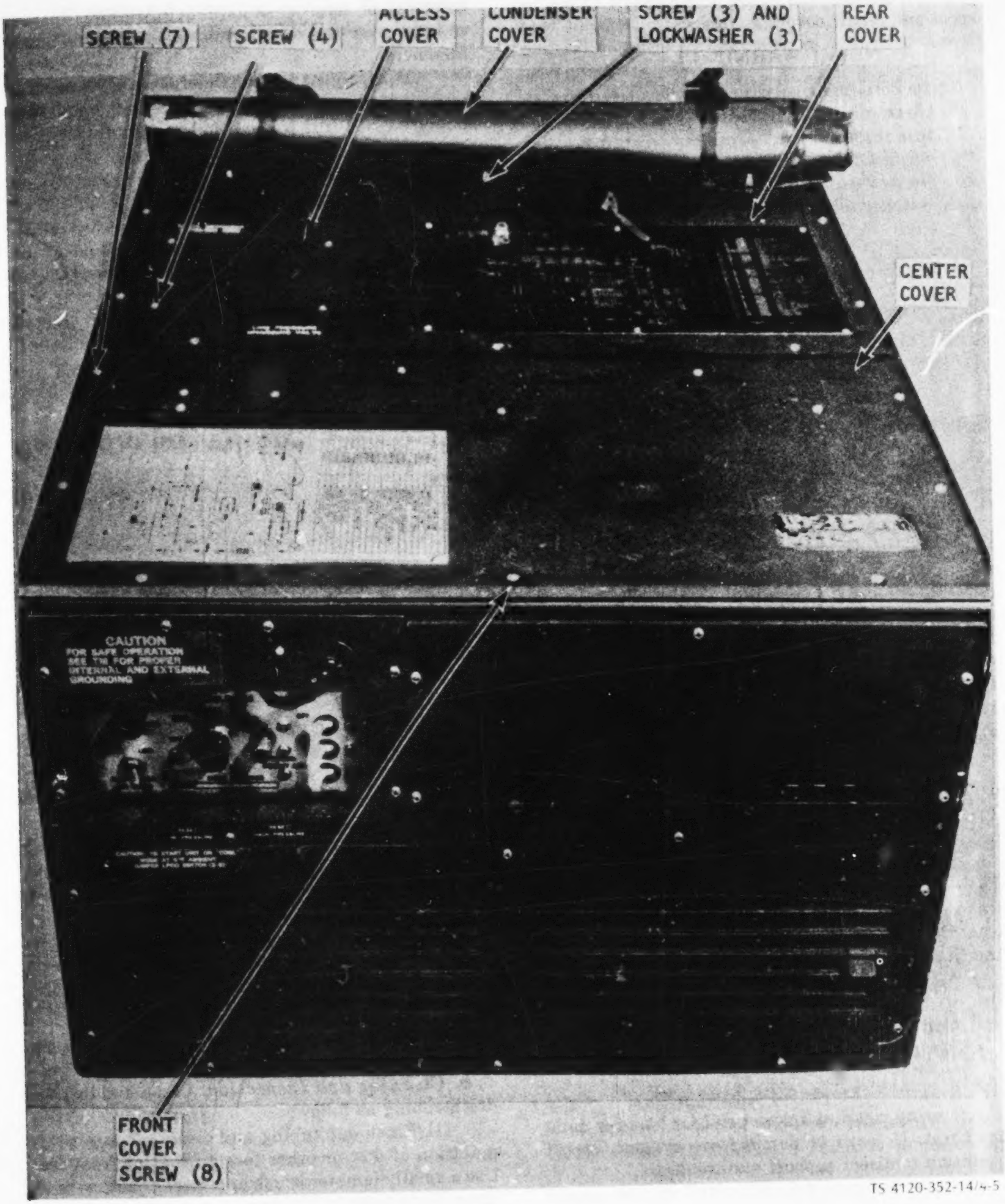
b. Removal.

(1) To remove front cover, remove eight screws (fig. 4-5) and remove front cover.

(2) To remove access cover (fig. 4-5), remove four screws and remove cover.

(3) To remove rear cover (fig. 4-5), remove three screws and lockwashers and remove condenser cover. Remove seven screws and rear cover.

(4) The front and rear covers must be removed before removing the center cover (fig. 4-5). Remove six screws. Remove two screws securing thermostatic switch bracket to cover.


SCREW (7)
SCREW (4)
ACCESS COVER
CONDENSER COVER
SCREW (3) AND LOCKWASHER (3)
REAR COVER
CENTER COVER
CAUTION
FOR SAFE OPERATION
SEE TM FOR PROPER
INTERNAL AND EXTERNAL
GROUNDING
FRONT COVER SCREW (8)

TS 4120-352-14/4-5

Figure 4-5. Housing covers.

c. Cleaning, Inspection and Repair. Clean, inspect and repair covers as follows:

WARNING

Dry cleaning solvent, P-D-680, used to clean parts, is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100° - 138° F (38° -59° C).

(1) Brush off any loose dirt or goreign matter from gaskets and insulation. Wipe off tops of metal parts with a cloth dipped in cleaning solvent (Fed. Spec. P-D-680). Wash dirt from condenser cover.

(2) Inspect metal covers for distortion and damaged or loose gaskets and insulation. Inspect canvas cover for torn condition and for damaged fasteners.

(3) Straighten a bent metal cover, cement or replace loose or damaged gaskets and insulation. Replace cover if it will not form a satisfactory seal after repair.

(4) Replace condenser cover if damaged.

d. Installation. Refer to figure 4-5 and install cover as follows:

(1) Install thermostatic switch bracket on center cover and secure with two screws. Install center cover and six screws.

(2) Install rear cover and seven scres. Install condenser cover and three screws and lockwashers.

(3) Install access cover and four screws.

(4) Install front cover and eight screws.

Section IX. MAINTENANCE OF CONDENSER COIL, EVAPORATOR COIL AND DRAINS

4-22. General.

The condenser coil (fig. 1-3) and evaporator coil require periodic cleaning to insure full air flow through the coils and maximum heat transfer duing operation. The evaporator drain tubes (fig. 4-6), located under the evaporated coil in the evaporator fan compartment, are connected to a drain tube in the housing. The housing drain tube terminates in the drain openings at the rear of the housing. Drain tubes must be open to prevent buildup of condensates under the evaporator coil.

4-23. Servicing Condenser Coil.

a. Refer to figure 4-5 and remove rear cover and condenser cover.

b. Clean the surface of the condenser coil with a soft bristle brush. Blow dirt out from between the fins with compressed air. Hold nozzle of air hose at least 6 to 8 inces away from coil to avoid damaging the fins.

WARNING

Compressed air is not to exceed 15 psi. Do not use steam to clean coils.

c. During cleaning inspect coil for leaks or damaged fins. If leaks or damage are evident, report condition to direct support maintenance.

d. Refer to figure 4-5 and install rear cover and condenser cover.

4-24. Servicing Evaporator Coil.

a. Refer to paragraph 4-17 and remove evaporator outlet louver and mist eliminator. Refer to figure 4-5 and remove front cover.

b. Clean the surface of the evaporator coil with a soft bristle brush. Blow dirt out from between the fins with compressed air. Hold nozzle of air hose at least 6 to 8 inches away from coil to avoid damaging the fins.

WARNING

Compressed air is not to exceed 15 psi. Do not use steam to clean coils.

c. During cleaning, inspect coil for leaks or damaged fins. If leaks or damage are evident, report conditions to direct support maintenance.

d. Refer to paragraph 4-18 and install outlet louver. Refer to paragraph 4-21 and install front cover.

4-25. Evaporator Drain Tubing.

a. Removal. Refer to figure 4-6 and remove six hose clamps, tee, and three pieces of flexible tubing.

b. Cleaning and Inspection. Clean and inspect drain tubing as follows:

(1) Flush out tubing and clean out any accumulation of dirt or other foreign matter from tee. Use a small diameter brush or a piece of soft wire to clean drain tube in housing.

(2) Inspect tubing for split or deteriorated condition. Inspect tee for cracks. Replace defective parts.

c. ***Installation.*** Refer to figure 4-6 and install drain tubing as follows:

(1) Connect each piece of tubing to tee with hose clamps.

(2) Connect tubing to drain connections with hose clamps.

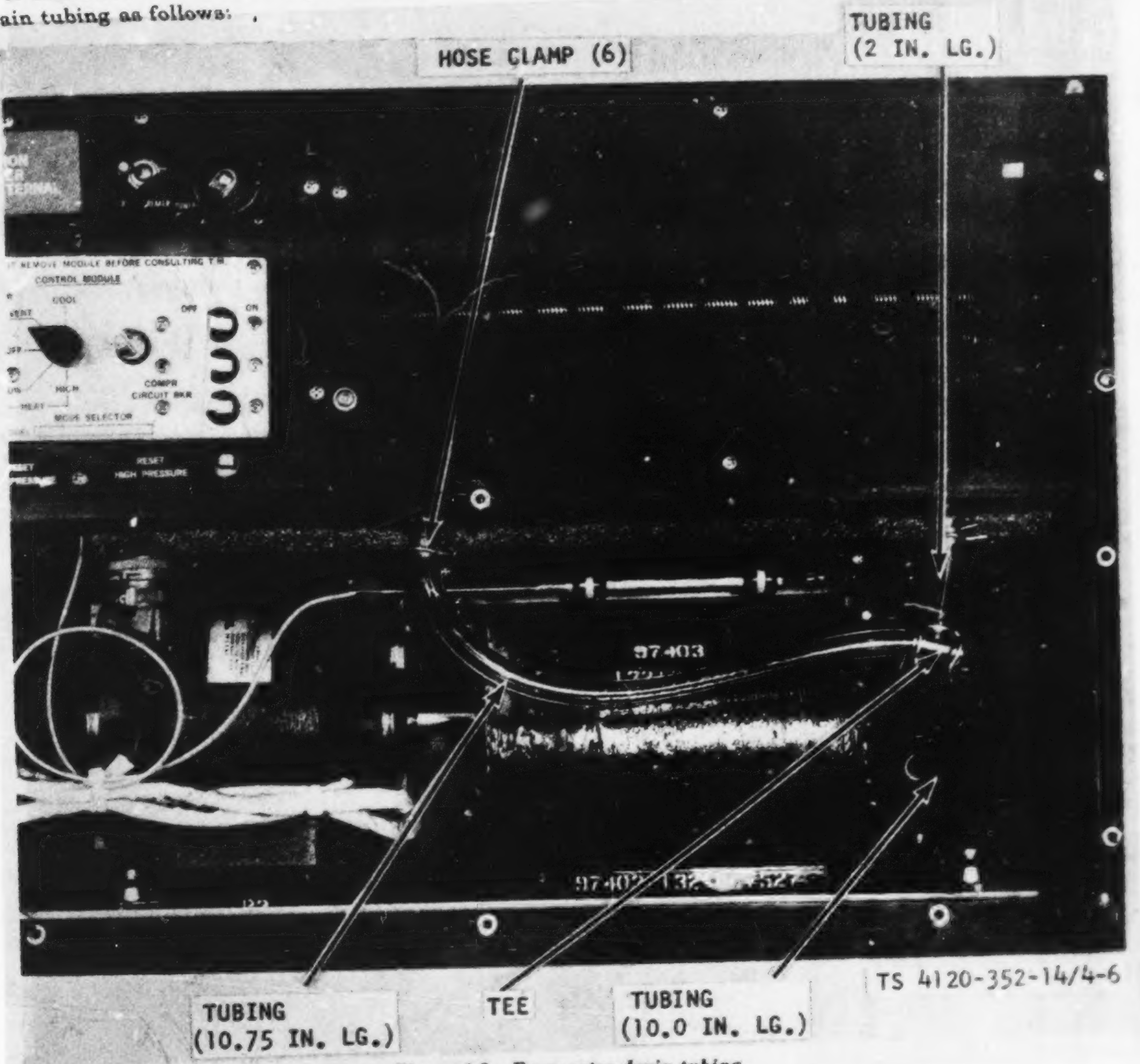


Figure 4-6. Evaporator drain tubing.

Section X. MAINTENANCE OF FRESH AIR VENT DAMPER AND CONTROL

4-26. General.

The vent damper opens and closes the fresh air inlet passage. It is opened and closed by a push-pull type control attached to the damper and to an actuator (fig. 2-3).

4-27. Adjustment.

a. The wire core of the push-pull control is attached to the actuator (fig. 4-7) and to the rod on top of the vent damper (fig. 4-8) by a mechanical post. To change the adjustment at either end, loosen the screw on the mechanical post, set the actuator or damper rod, and tighten the screw.

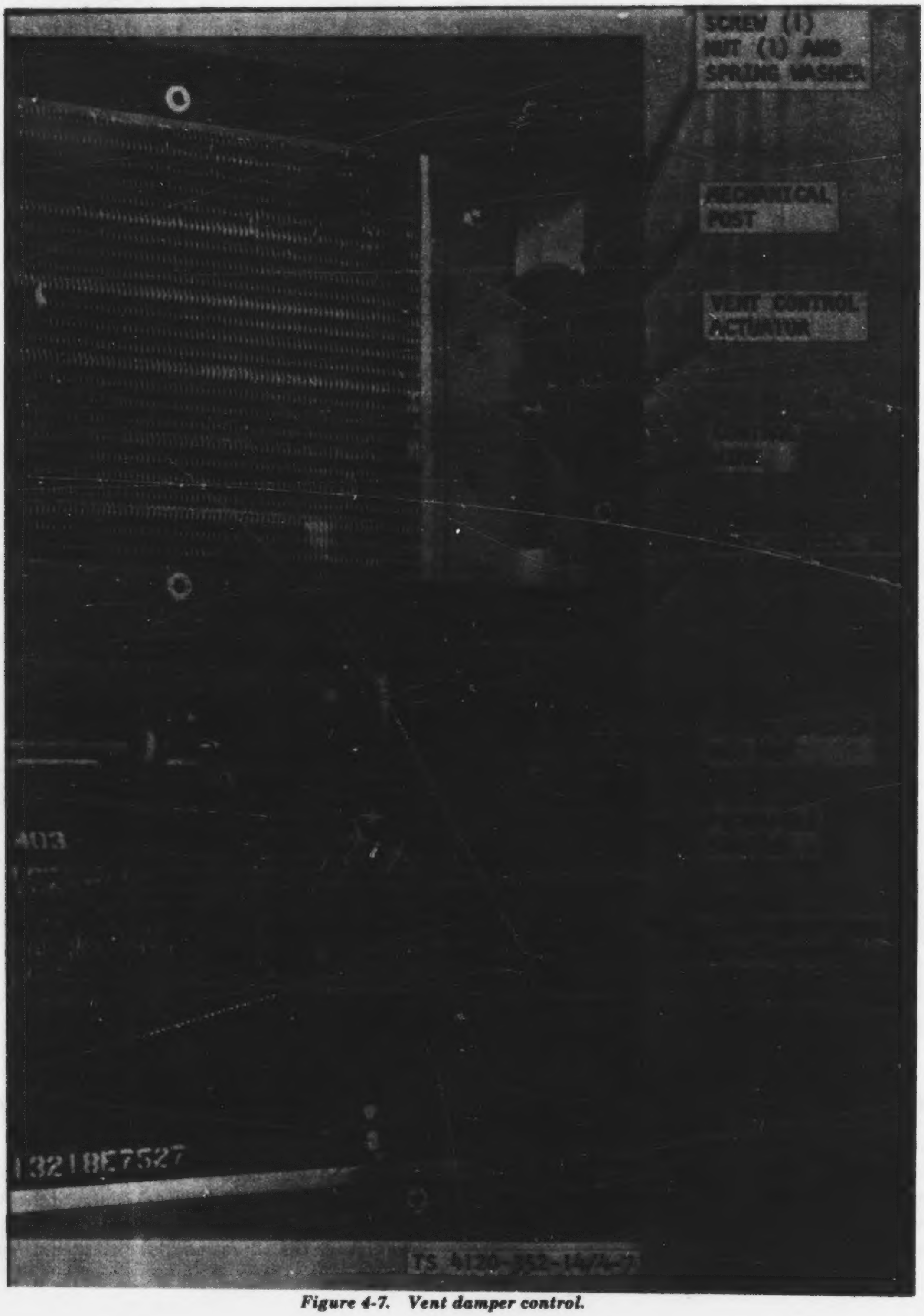
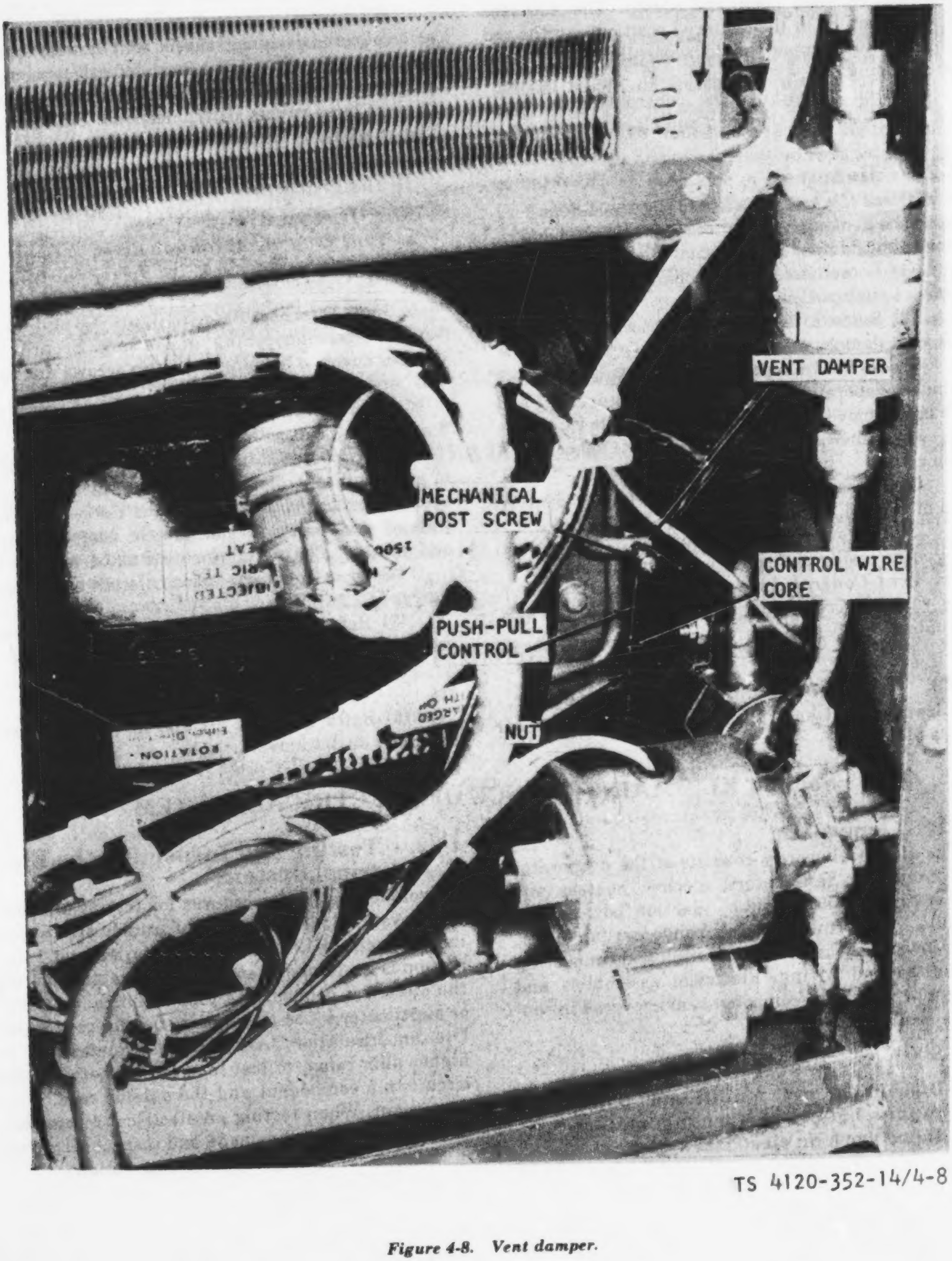

SCREW (1)
NUT (1) AND
SPRING WASHER
MECHANICAL
POST
VENT CONTROL
ACTUATOR
13218E7527
TS 4120-352-14/4-7

Figure 4-7. Vent damper control.


VENT DAMPER
MECHANICAL POST SCREW
CONTROL WIRE CORE
PUSH-PULL CONTROL
NUT
FLOW

TS 4120-352-14/4-8

Figure 4-8. Vent damper.

b. The control should be adjusted for the center position between open and closed. The actuator should then be in the centered position and the rod on top of the damper should be parallel with front of the housing.

c. Check operation. The control should move smoothly between the open and closed position.

4-28. Removal.

a. Vent Damper. Refer to figure 4-5 and remove the housing covers. Refer to figure 4-8 and remove vent damper as follows:

(1) Loosen screw on mechanical post and disconnect push-pull control.

(2) Remove two screws and lockwashers and lift vent damper from air conditioner.

b. Psuh-Pull Control. Refer to figure 4-2 and remove evaporator louvers. Refer to figures 4-7 and 4-8 and remove push-pull control as follows:

(1) Remove screw, washer, nut, spacer, and loop clamp.

(2) Loosen screw on mechanical post to free end of control wire core.

(3) Remove outer nuts from both ends of control outer casing and remove push-pull control.

c. Vent Control Actuator. Refer to figure 4-7 and remove screw, nut, two spring washers and actuator.

4-29. Cleaning, Inspection and Repair.

Clean, inspect and repair vent damper and control as follows:

(1) Wipe off all loose dirt with a dry cloth.

(2) Inspect push-pull control for smooth operation of core in casing. Inspect vent damper for bent or broken condition. Replace defective parts. Inspect for loose or damaged rubber seal on damper. Cement loose rubber or replace rubber if damaged. Inspec actuator for bent condition. Straighten actuator or replace as required.

4-30. Installation.

a. Vent Control Actuator. Refer to figure 4-7 and install actuator, screw, two spring washers and nut.

b. Vent Damper. Refer to figure 4-8 and install vent damper in opening in housing. Secure cent damper cover to housing with two screws and lockwashers.

c. Push-Pull Control. Refer to figure 4-7 and 4-8 and install control as follows:

(1) With one nut on each end of outer casing of push-pull control, install ends of control through opening in housing. Install outer nuts and insert ends of wire core into mechanical post of damper and actuator. Tighten outer nuts on casing.

(2) Install clamp, spacer, screw, nut, and washer.

(3) Refer to paragraph 4-27 and adjust the control.

(4) Refer to figure 4-5 and install housing covers.

(5) Refer to figure 4-2 and install evaporator inlet and outlet louvers.

Section XI. MAINTENANCE OF ELECTRICAL SYSTEM

4-31. General.

The electrical system consists of the evaporator and condenser fan motors, electric heaters and heater thermostatic switch, junction box, control module, transformer, rectifier, condenser fan motor, high-low speed thermostatic switch and connecting harnesses and wiring. Electrical assemblies and groups of associated components are covered in separate sections.

WARNING

Disconnect air conditioner power supply before performing maintenance work on electrical system.

4-32. Testing and Inspecting the Electrical System.

Troubleshooting procedures for testing the electrical system to isolate cause of trouble are covered in paragraph 4-12. Additional detailed test information is contained in specific paragraphs covering the electrical components. Use a continuity tester or multimeter set on low ohms to test for continuity. Use an insulation tester or multimeter set on higher ohm range to test for grounds between the circuit in a component and the outside case of the component. When testing an electrical component, check also for visual damage and inspect all wiring in the area for damage or loose connections.

4-33. Wiring Harnesses and Leads.

a. General. The electrical circuits in the air conditioner are completed either by individual wire leads or by wire leads laced or enclosed in a loom to form a wiring harness. All of the wiring carries code numbers. When testing, repairing or replacing the wiring harness or individual wires, refer to the wiring diagram (1-5) and schematic diagram (1-4).

b. Inspection. Inspect all wiring installation for cracked or frayed insulation material. Pay particular attention to wires passing through holes in the frame or around sharp edges. Repair or replace defective wiring. Inspect electrical connectors and fittings for damage or broken condition. Replace defective connectors and fittings.

c. Testing. Test for continuity in leads or wiring harnesses by disconnecting each end. Where wires terminate in an electrical connector, disconnect connector from corresponding receptacle connector or plug connector. Touch the test probes of a continuity tester, or multimeter set on low ohms to ends of wire or corresponding pin of connector. If continuity is not indicated, repair or replace wire.

d. Repair. Remove insulation to expose 1/2 inch of bare wire on each side of break. Twist the wire ends and solder the splice. Cover the splice with PVC electrical tape, making certain to cover all the repaired area. Replace broken terminal lugs with exact duplicates. To replace electrical connectors, unsolder wires from solder wells to inserts. Install new connector and insert ends of wires in solder wells. Solder wires in place. Check connections carefully. Refer to wiring diagrams.

Section XII. MAINTENANCE OF HEATERS AND THERMOSTATIC SWITCH

4-34. Heater Thermostatic Switch.

a. General. The heater thermostatic switch, mounted in a bracket under the housing center cover, protects the air conditioner from overheating if the heating element circuit is actuated and the air flow is restricted or stopped.

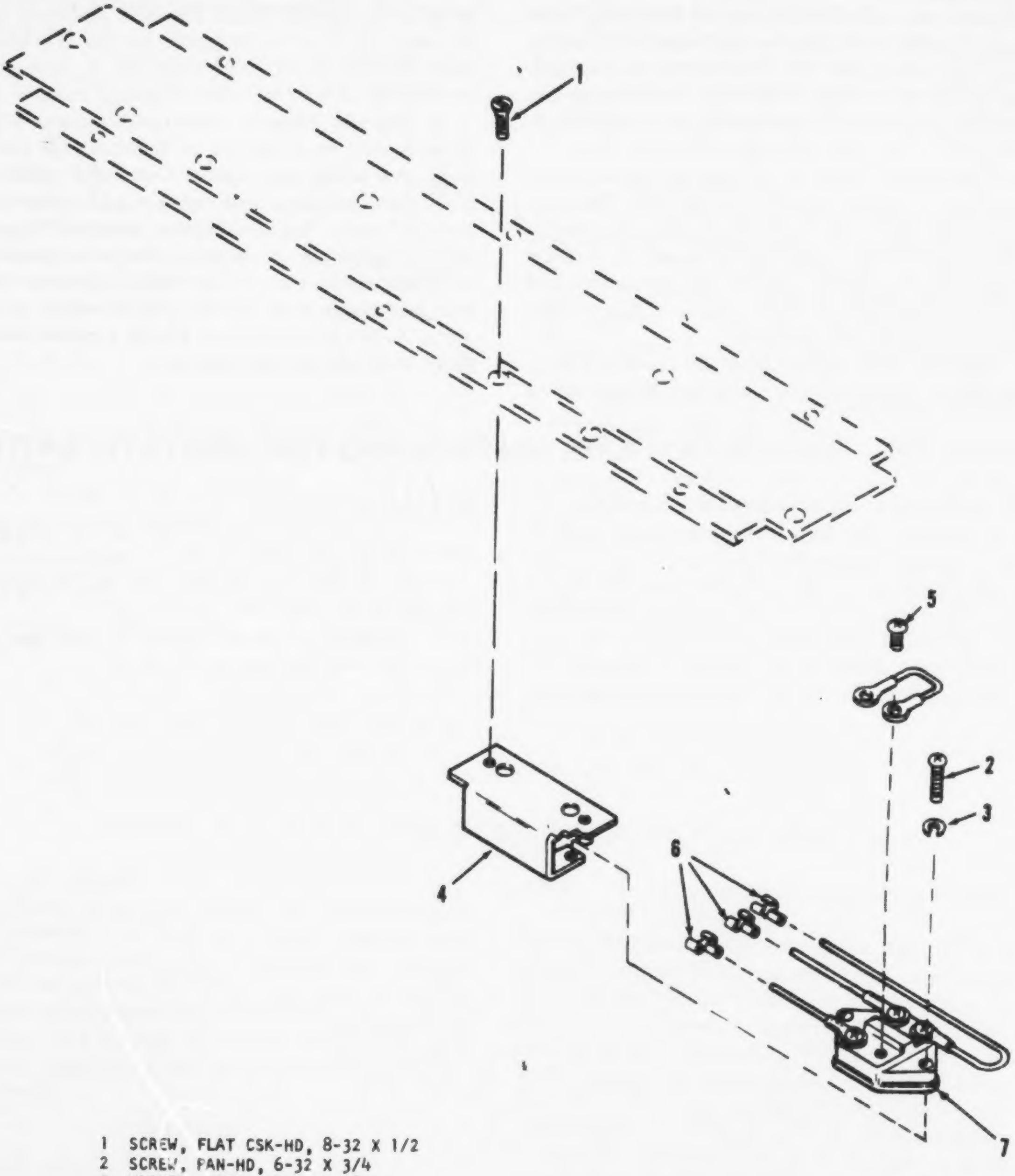
b. Removal. Remove the switch as follows:

(1) Refer to figure 4-5 and remove housing front cover.

(2) Refer to figure 4-9 and remove two screws (1) to remove bracket and switch from center cover.

(3) Remove two screws (2) and lockwashers (3) and remove bracket (4).

(4) Remove switch screws (5) and disconnect leads (6) from thermostatic switch (7).



1 SCREW, FLAT CSK-HD, 8-32 X 1/2
2 SCREW, PAN-HD, 6-32 X 3/4
3 WASHER, LOCK, SPR, NO. 6
4 BRACKET
5 SWITCH TERMINAL SCREW
6 LEAD
7 SWITCH, THERMOSTAT

TS 4120-352-14/4-9

Figure 4-9. Heater thermostatic switch, exploded view.

c. ***Cleaning and Inspection.*** Wipe off any accumulation of dust and test as described below.

(1) Test for continuity between contacts 1 and 2 and also between contacts 3 and 4. Contacts should open on temperature rise at 150 F + 5° (65.5 C + 2.25°) and close on temperature drop at 110 F + 10° (43 C + 5.5°).

(2) Replace switch if it fails to meet test requirements.

d. ***Installation.*** Refer to figure 4-9 and install heater thermostatic swithc.

(1) Refer to wiring diagram and connect leads (6) to switch (7) with screw (5).

(2) Attach switch to bracket (4) with screws (2) and lockwashers (3).

(3) Secure bracket to center cover with two screws (1).

(4) Refer to figure 4-5 and install housing front cover.

4-35. Heater Elements.

a. ***General.*** The air conditioner is equipped with six heating elements, two across each phase. One element in each phase is switched out for low heat. A thermostatic switch cycles off and on to provide temperature contro.

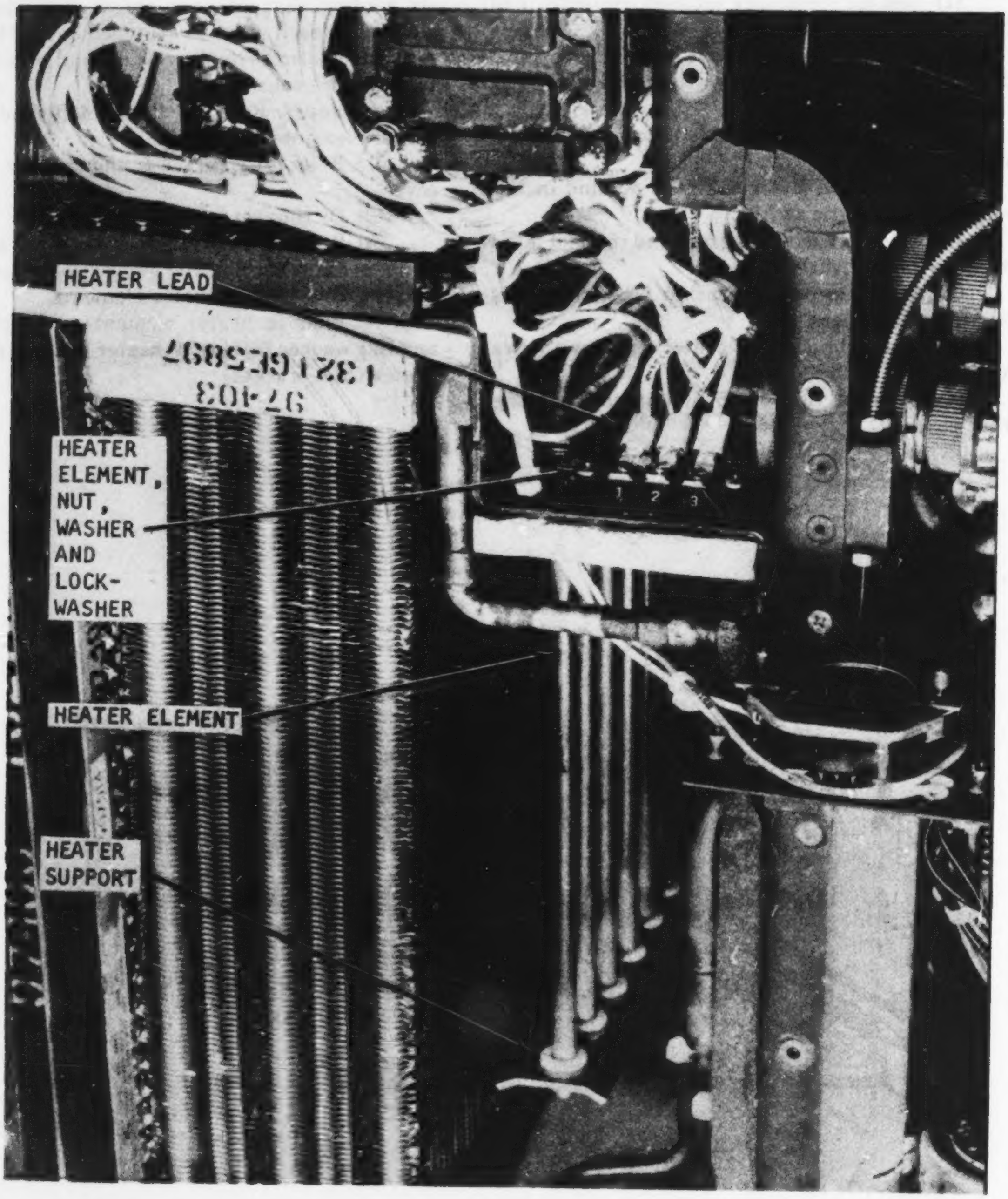
b. ***Removal.*** Refer to figure 4-10 and remove heater elements as follows:

(1) Refer to figure 4-5 and remove housing cover.

(2) Disconnect leads from heaters.

(3) Remove two screws, washers, and lock washers that secure heater supportto housing. Slide support from ends of heater elements.

(4) Remove heater element nut, lockwasher and flat washer from each heater in turn, and slide heater from bracket.


HEATER LEAD
HEATER ELEMENT, NUT, WASHER AND LOCK-WASHER
HEATER ELEMENT
HEATER SUPPORT
1
2
3

TS 4120-352-14/4-10

Figure 4-10. Heater elements and support.

*c. **Cleaning and Inspection.*** Wipe off all accumulated dirt from heater elements and inspect for visible damage to element or leads. Check each heater element for continuity. Replace defective heaters. Repair damaged leads.

*d. **Installation.*** Refer to figure 4-10 and install heater elements as follows:

(1) Insert heaters in bracket and support with an insulating washer between bracket and flange of each heater element.

(2) Install washer, lock washer and nut on each heater element. Secure support with two screws, washers, and lockwashers.

(3) Refer to wiring diagram and make connections to heaters.

(4) Refer to figure 4-5 and install housing covers.

Section XIII. MAINTENANCE OF FAN MOTORS

4-36. General.

The evaporator fan and condenser fan motors are identical. The evaporator fan and motor are mounted on a common base in the lower front compartment of the air conditioner. The condenser fan motor is mounted on a separate base in the rear compartment of the air conditioner.

4-37. On-Equipment Testing.

a. Disconnect motor lead electrical connector.

b. Use a multimeter and test for continuity across each combination of two motor terminals. If continuity is not indicated, the windings are open and the motor should be replaced.

c. Place one multimeter probe against the motor housing and the other against one of the motor terminals. If continuity is indicated, the motor is grounded.

d. Replace motor if open or grounded.

NOTE

There are separate circuits through the thermal protectors on high and low speed circuits; check for continuity across terminals in the same circuit. Refer to wiring diagram.

4-38. Fan Motors.

*a. **Evaporator Fan Motor.*** Refer to figure 4-11 and remove evaporator fan motor as follows:

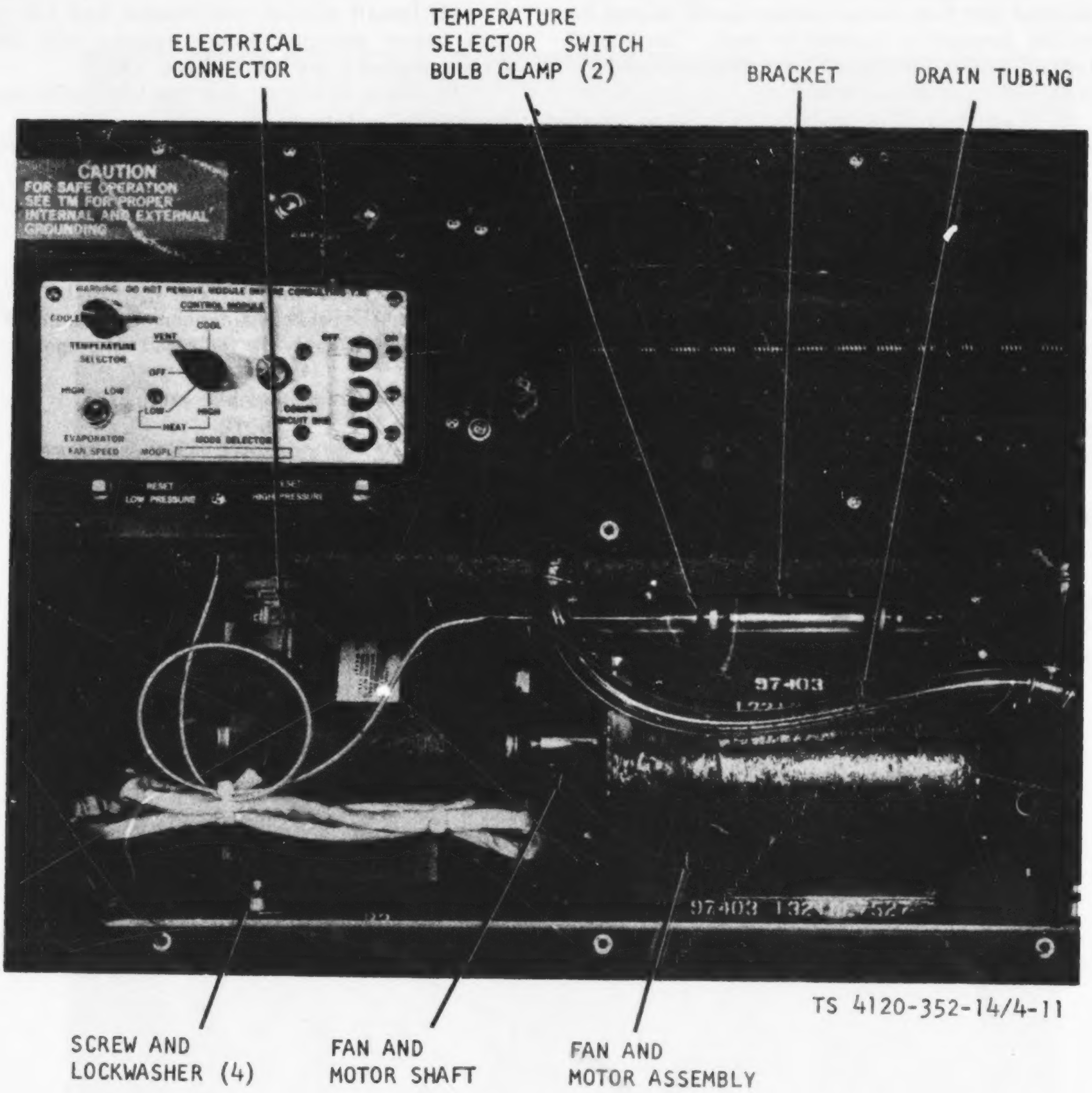

TEMPERATURE SELECTOR SWITCH BULB CLAMP (2)
ELECTRICAL CONNECTOR
BRACKET
DRAIN TUBING
CAUTION
FOR SAFE OPERATION SEE TM FOR PROPER INTERNAL AND EXTERNAL GROUNDING
CONTROL MODULE
TEMPERATURE SELECTOR
COOL
VENT
OFF
LOW
HEAT
HIGH
EVAPORATOR FAN SPEED
MODE SELECTOR
RESET LOW PRESSURE
RESET HIGH PRESSURE
97403
97403 132
TS 4120-352-14/4-11
SCREW AND LOCKWASHER (4)
FAN AND MOTOR SHAFT
FAN AND MOTOR ASSEMBLY

Figure 4-11. Evaporator fan and motor assembly.

(1) Refer to figure 4-2 and remove evaporator air inlet louver.

(2) Disconnect motor electrical connector.

(3) REfer to figure 4-6 and disconnect evaporator drain tubing.

(4) Remove three brackets above fan to facilitate removal of fan and motor assembly. Remove two screws, lockwashers and clamps. Move temperature selector bulb clear of fan.

(5) Remove four screws and lockwashers securing fan and motor base to resilient mounts and remove fan and motor assembly.

(6) To remove motor from the assembly, remove four cap screws and lockwashers from underside of base. Loosen setscrew in fan and motor shaft and remove motor.

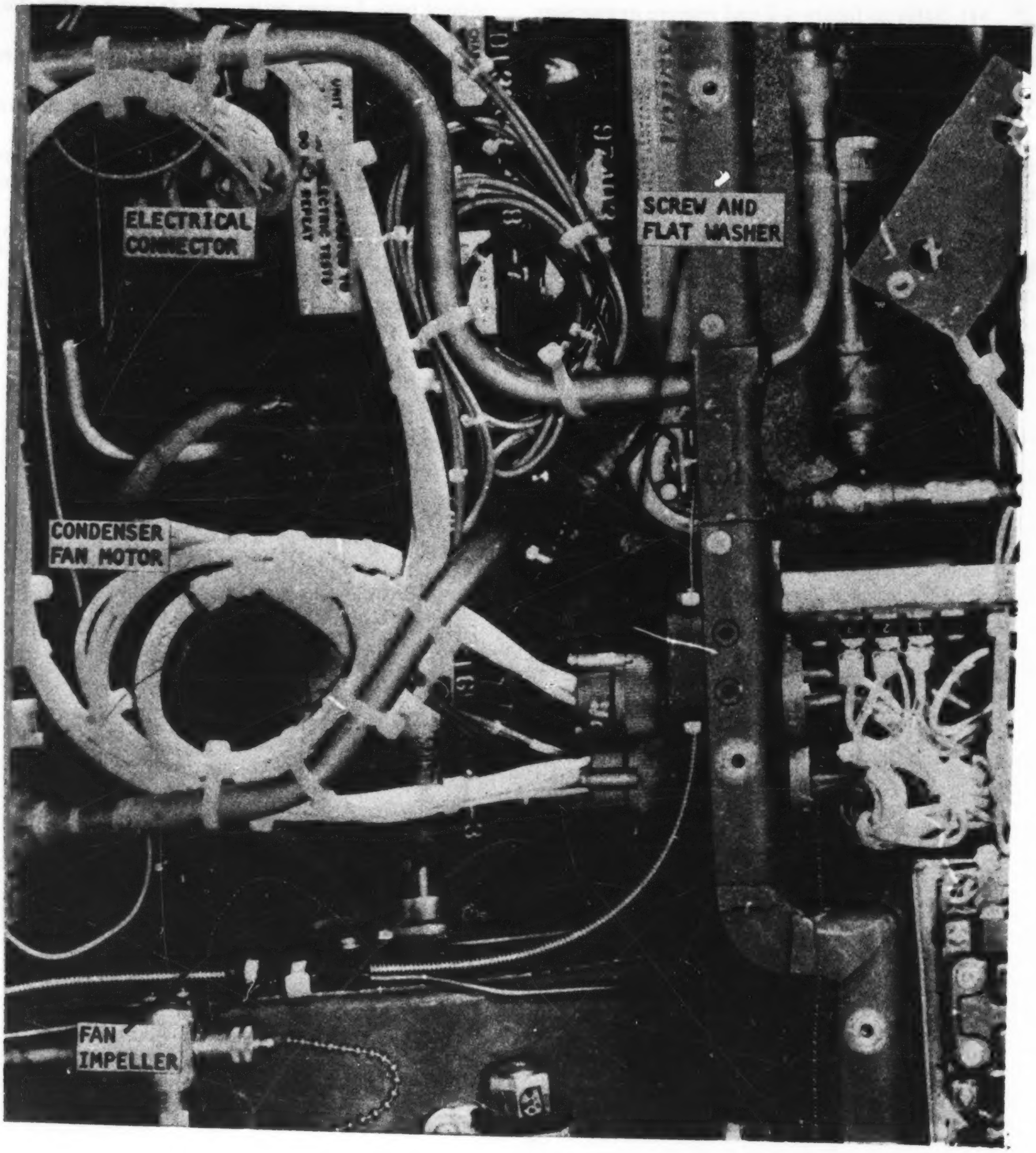
b. Condenser Fan Motor. Remove condenser fan motor as follows:

(1) Refer to figure 4-5 and remove housing covers.

(2) Refer to figure 4-12 and remove four screws and flat washers that secure motor mounting plate to housing.

(3) Disconnect motor lead electrical connector. Remove wire ties as required.

(4) Loosen setscrew in hub of fan impeller and remove impeller from shaft of motor.

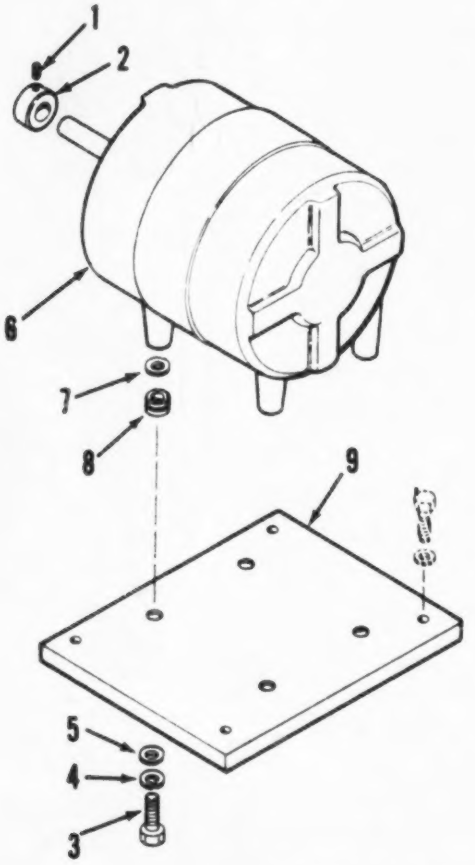

ELECTRICAL CONNECTOR
SCREW AND FLAT WASHER
CONDENSER FAN MOTOR
FAN IMPELLER

TS 4120-352-14/4-12

Figure 4-12. Condenser fan and motor.

(5) Remove motor and mounting plate from air conditioner.

(6) Refer to figure 4-13 and remove setscrew (1) and collar (2) from motor shaft. Remove four cap screws (3), lockwashers (4) and flat washers (5). Remove motor (6) and four flat washers (7) from mounting plate (9). Remove bushings (8) from plate only if they require replacement.



TS 4120-352-14/4-13

1. Setscrew, ¼-28 x ¼
2. Collar
3. Screw, cap, hex-hd, ¼-28 x 1"
4. Washer, lock, spr, ¼ in.
5. Washer, flat, ⅝ OD
6. Motor
7. Washer, flat, ⅝ OD
8. Bushing
9. Mounting plate

Figure 4-13. Connector fan motor and mounting plate, exploded view.

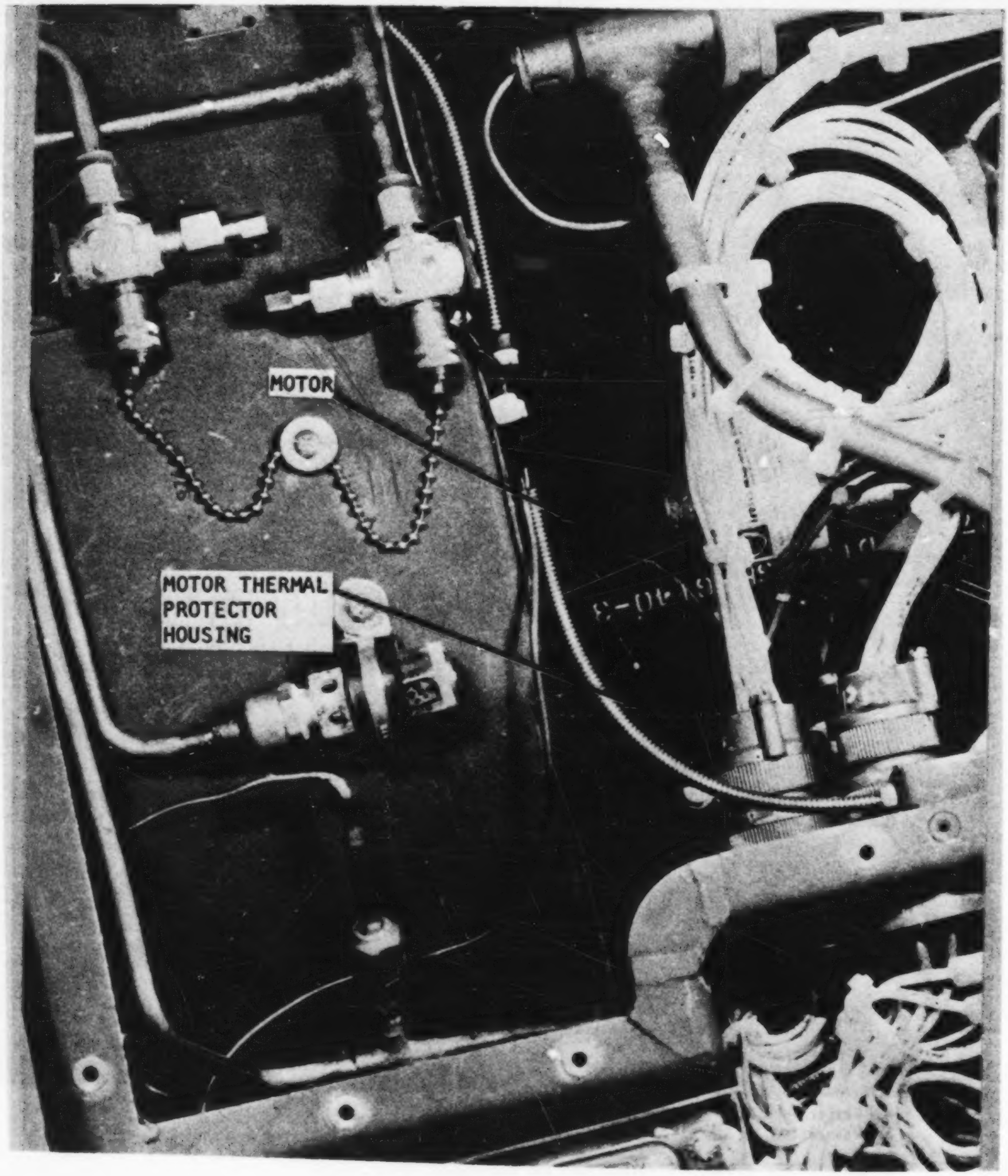
c. Fan Motor Thermal Protector Replacement.

(1) **General.** Organizational repair of motors is limited to testing and replacement of defective thermal protectors. Instructions contained in this paragraph cover replacement of the motor thermal protectors.

(2) **Removal.** Refer to figure 4-14 and partially remove thermal protector housing from motor by removing two screws and washers. Tag and disconnect electrical leads. Remove thermal protector. Remove other protector in the same manner.

(3) **Testing.** Check for continuity between terminals. Replace protector if open.

(4) **Installation.** Install thermal protector in housing and connect leads. Install thermal protector housing on motor and secure with screws and washers previously removed.


MOTOR
MOTOR THERMAL PROTECTOR HOUSING

TS 4120-352-14/4-14

Figure 4-14. Motor thermal protector housing.

d. Installation.

(1) **Evaporator Fan Motor.** Install evaporator fan motor as follows:

(a) Set motor on fan-and-motor base with motor base in fan-and-motor shaft (fig. 4-11). Install four cap screws and lockwashers through underside of base to secure motor. Tighten setscrew in fan-and-motor shaft.

(b) Install fan and motor assembly on resilient mounts and install four screws and lockwashers (fig. 4-11).

(c) Install brackets above fan. Install temperature selector switch bulk in clamps and secure clamps with screws and lockwashers.

(d) Refer to figure 4-6 and install evaporator drain piping.

(e) Connect motor electrical connector.

(f) Refer to figure 4-2 and install evaporator air inlet louver.

e. Condenser Fan Motor. Assemble motor on mounting plate and install motor and mounting plate as follows:

(1) Refer to figure 4-13,and install bushings (8) in mounting plate (9) if they were removed.

(2) Place a washer (7) over each bushing and set motor (6) on washers. Install four screws (3), washers (5), and lockwashers (4). Install collar (2) on motor shaft and install setscrew (1).

(3) Install plate and motor in air conditioner and slide fan impeller (fig. 4-12) on motor shaft. Install four screws and flat washers.

(4) Connect motor electrical connector.

(5) Refer to figure 4-2 and install housing covers.

Section XIV. MAINTENANCE OF FAN MOTOR SWITCHES

4-39. Evaporator Fan Motor Speed Control Switch.

The evaporator fan motor speed control switch is a toggle switch which is part of the control module. Replacement instructions for this switch are included with the control module.

4-40. Condenser Fan Motor Speed Control.

a. General. The condenser fan motor speed control thermostatic switch, located on the rear wall of the housing, automatically controls the fan motor speed. The switch is normally open and closes on temperature rise between 95°F and 105°F (35°C and 40.6°C). When the switch contacts close the condenser fan relay coil is energized and the relay shifts the fan motor circuit from low-speed to high-speed.

b. Testing. Test the switch and connector assembly in the air conditioner as follows:

(1) Refer to figrure 4-5 and remove rear top cover.

(2) Disconnect electrical connector located just below condenser motor electrical connecter (fig. 4-12).

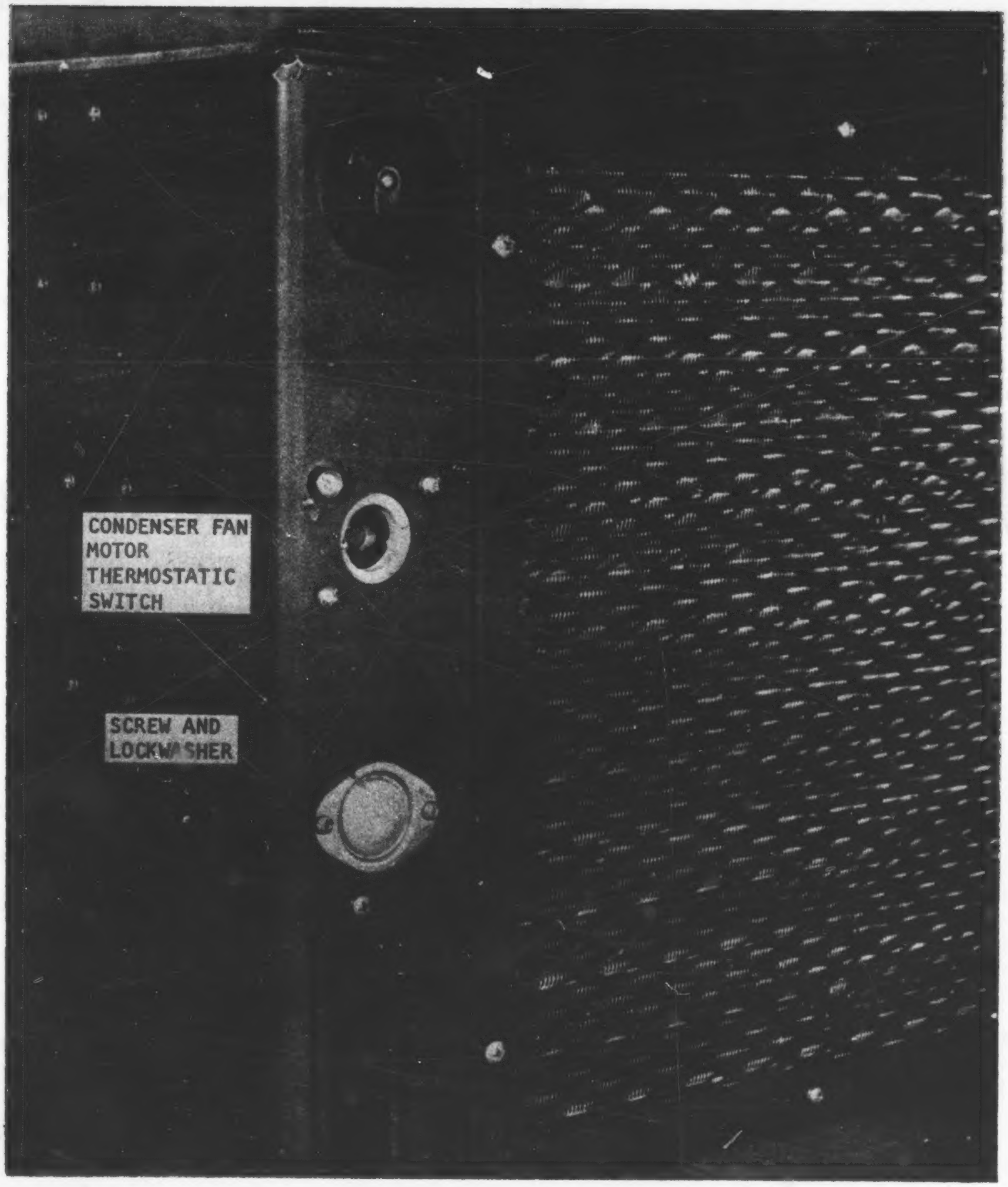
(3) Check for continuity between terminals of connector. There should be no continuity between terminals when temperature is below 95°F (35°C). If a source of heated air is available, check for closing of contacts and continuity between terminals at 95°F to 105°F (35°C to 40.6°C).

(4) If switch and connector assembly do not meet requirements, check wiring and repair damaged wiring or replace switch.

c. Removal. With top cover removed and electrical connector disconnected, proceed as follows:

(1) Refer to figure 4-15 and remove two screws and lockwashers. Remove switch and connector assembly.

(2) Disconnect switch leads from connector.


CONDENSER FAN MOTOR THERMOSTATIC SWITCH
SCREW AND LOCKWASHER

TS 4120-352-14/4-15

Figure 4-15. Condenser fan motor thermostatic switch.

d. Installation. Install the condenser fan thermostatic switch as follows:

(1) Connect switch leads to connector.

(2) Refer to figure 4-15 and install switch in opening. Secure switch with two screws and lockwashers.

(3) Connect electrical connector.

(4) Refer to figure 4-5 and install rear top cover.

Section XV. MAINTENANCE OF CONTROL MODULE

4-41. General.

The control module is located in a compartment in the junction box. All electrical connections to the control module are through plug-in type connectors permitting easy removal fo the module as a unit. The control module contains the compressor circuit breaker, temperature selector switch, mode selector rotary switch, and the evaporator fan speed toggle switch.

WARNING

Disconnect air conditioner from power source before removing control module.

4-42. Control Module.

a. Removal.

(1) Refer to figure 4-2 and remove the evaporator air inlet louver.

(2) Refer to figure 4-16 and disengage temperature selector switch bulb from clamps by loosening clamp screws.

(3) Turn connector knob (fig. 4-16) counterclockwise until screw is disengaged and pull control module from junction box. Carefully pull temperature selector switch bulb through slot in bottom of junction box.

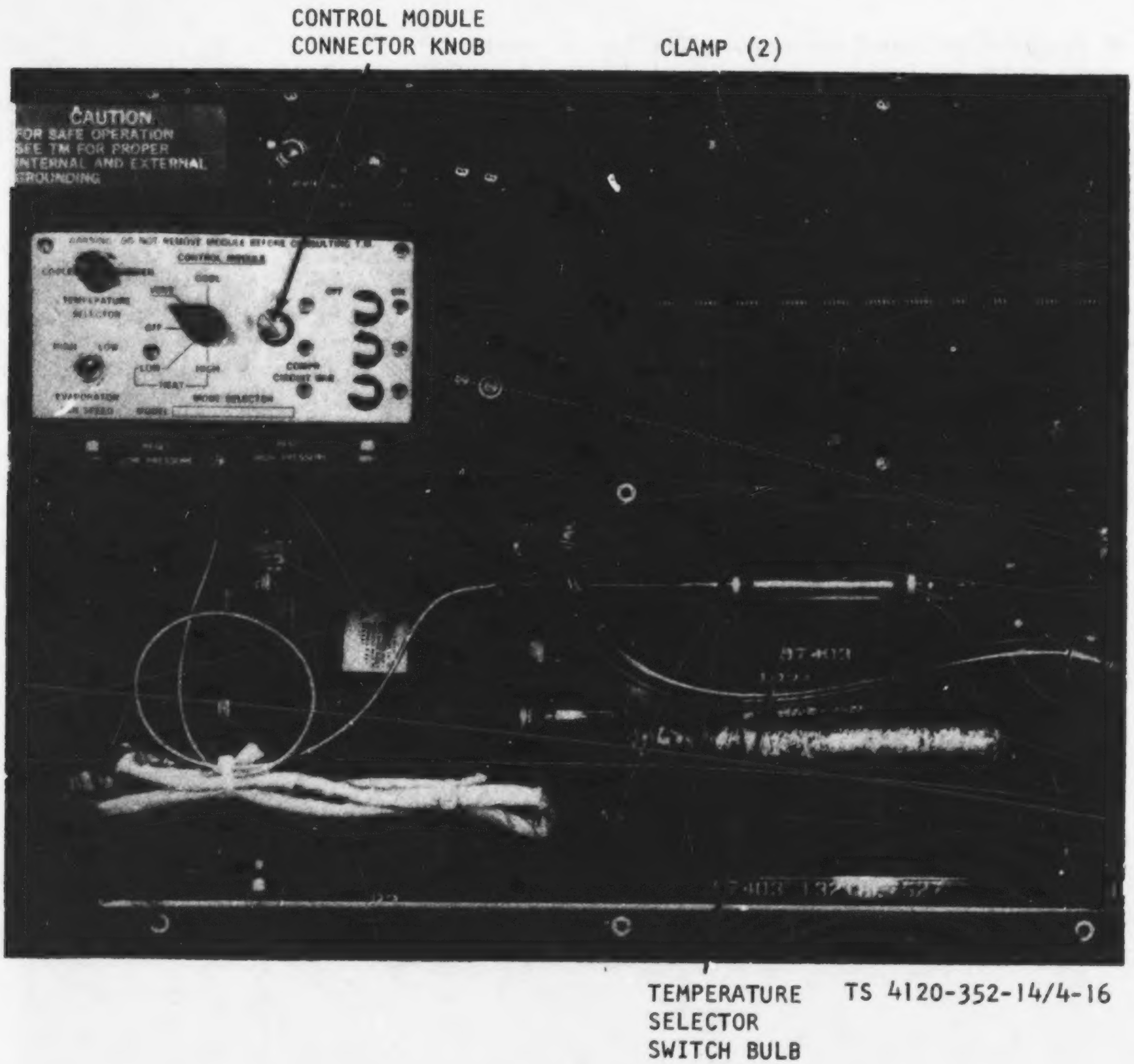

CONTROL MODULE
CONNECTOR KNOB
CLAMP (2)
CAUTION
FOR SAFE OPERATION
SEE TM FOR PROPER
INTERNAL AND EXTERNAL
GROUNDING
TEMPERATURE
SELECTOR
SWITCH BULB
TS 4120-352-14/4-16

Figure 4-16. Control module connector knob and bulk mounting.

b. Testing.

(1) **General.** Remove four screws securing cover to frame. Remove capillary tube grommet and slide cover from module. Pull capillary tube bulb through hole in cover. To test individual components, mark and disconnect leads, and check for continuity. Refer to schematic diagram as a guide and refer to the following additional instructions.

(2) **Circuit Breaker.** Check for continuity between corresponding terminals in closed position. Check for proper functioning in open position. Replace defective circuit breaker.

(3) **Evaporator Fan Toggle Switch.** Check for continuity in both positions. Replace defective switch.

(4) **Temperature Selector Switch.** Check for continuity between common terminal 1 and blue terminal 2. Switch should close when temperature drops below setting. Turn switch knob to full COOLER position. Switch should be open. Turn switch knob toward WARMER. Switch should close as setting becomes higher than bulb temperature. Replace defective switch.

(5) **Mode Selector Rotary Switch.** Refer to wiring diagram chart showing connections made by switch in various switch positions. Check for continuity. Replace defective switch.

c. Disassembly.

(1) **General.** Disassembly is limited to re-

placement of individual controls. Remove control module cover and mark and disconnect leads of control to be replaced.

(2) **Circuit Breaker.** Refer figure 4-17 and remove handle shaft and spacers. Remove six screws and washers that secure circuit breaker to mounting plate and designation plate and remove circuit breaker.

(3) **Evaporator Fan Toggle Switch.** Refer to figure 4-17 and remove the switch nut and lockwasher. Remove toggle switch.

(4) **Temperature Selector Switch.** Refer to figure 4-17 and remove nut and capillary tube clamp. Remove four screws, nuts, and washers. Remove switch knob and temperature selector switch.

(5) **Mode Selector Rotary Switch.** Refer to switch 4-17, loosen setscrew in knob and remove knob. Remove switch nut and switch.

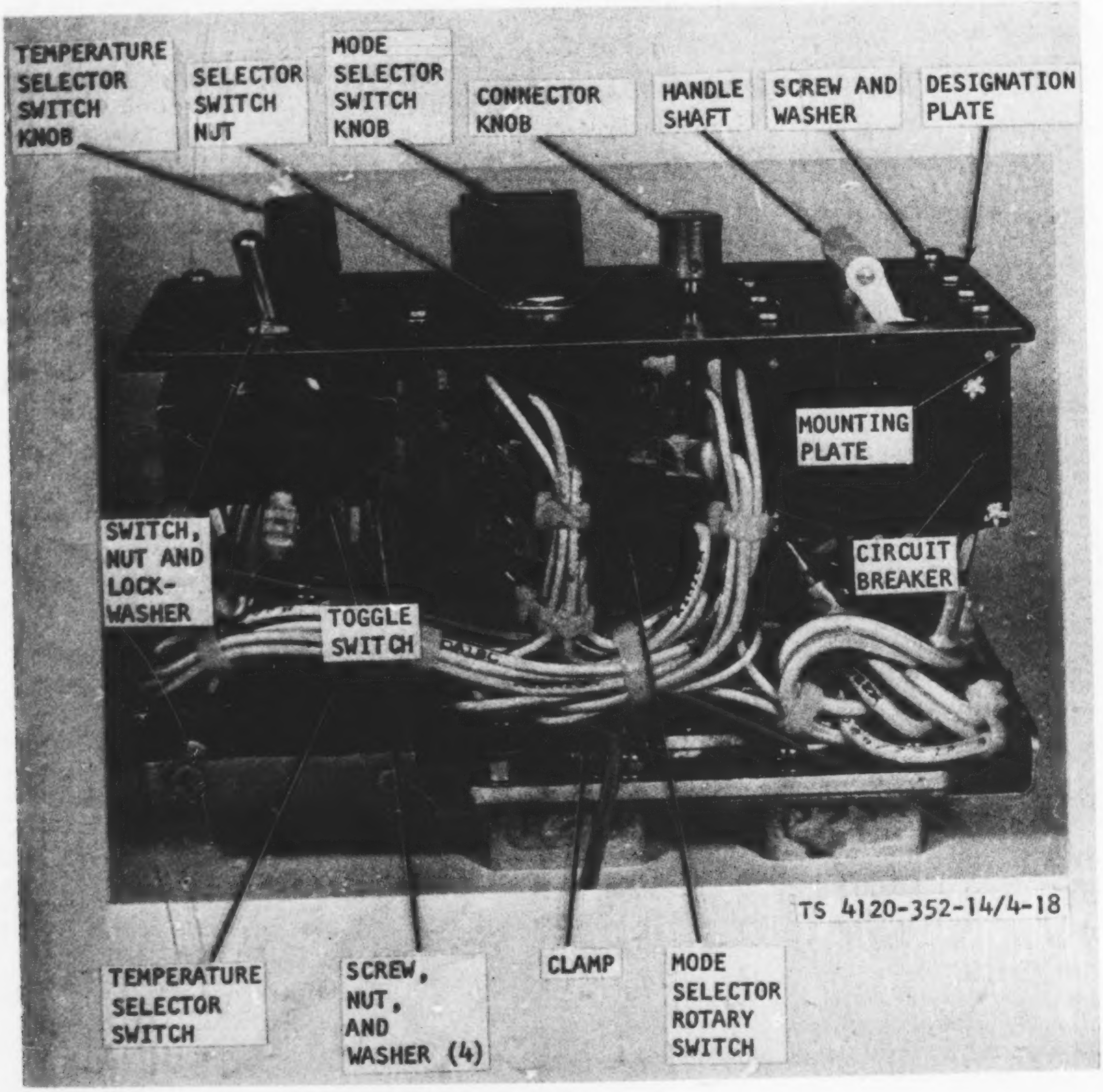

TEMPERATURE SELECTOR SWITCH KNOB
SELECTOR SWITCH NUT
MODE SELECTOR SWITCH KNOB
CONNECTOR KNOB
HANDLE SHAFT
SCREW AND WASHER
DESIGNATION PLATE
MOUNTING PLATE
SWITCH, NUT AND LOCK-WASHER
TOGGLE SWITCH
CIRCUIT BREAKER
TS 4120-352-14/4-18
TEMPERATURE SELECTOR SWITCH
SCREW, NUT, AND WASHER (4)
CLAMP
MODE SELECTOR ROTARY SWITCH

Figure 4-17. Control module less cover.

c. Assembly.

(1) **General.** Refer to figure 4-17 and install any components that were removed. Complete the assembly as described in (6) below.

(2) **Circuit Breaker.** Install circuit breaker, screws and washers. Assemble handle spacers and shaft.

(3) **Evaporator Fan Toggle Switch.** Install toggle switch and secure to mounting plate with switch nut and lockwasher.

(4) **Temperature Selector Switch.** Install switch and secure with four screws, washers, and nuts. Install switch knob. Install clamp on capillary tube and secure clamp with nut.

(5) **Mode Selector Rotary Switch.** Install switch and secure with switch nut. Install knob and tighten setscrew.

(6) **Control Module.** After components have been installed, make all necessary electrical connections. Insert capillary tube bulb through opening in cover. Install cover and mounting screws. Install capillary tube grommet.

d. Installation.

(1) Install temperature selector switch bulb and tube through slot in junction box. Install bulb in clamps (fig. 4-16) and tighten screws.

(2) Install control module into junction box and turn connector knob clockwise until screw is tight.

(3) Refer to figure 4-2 and install evaporator air inlet louver.

Section XVI. MAINTENANCE OF JUNCTION BOX

4-43. Junction Box.

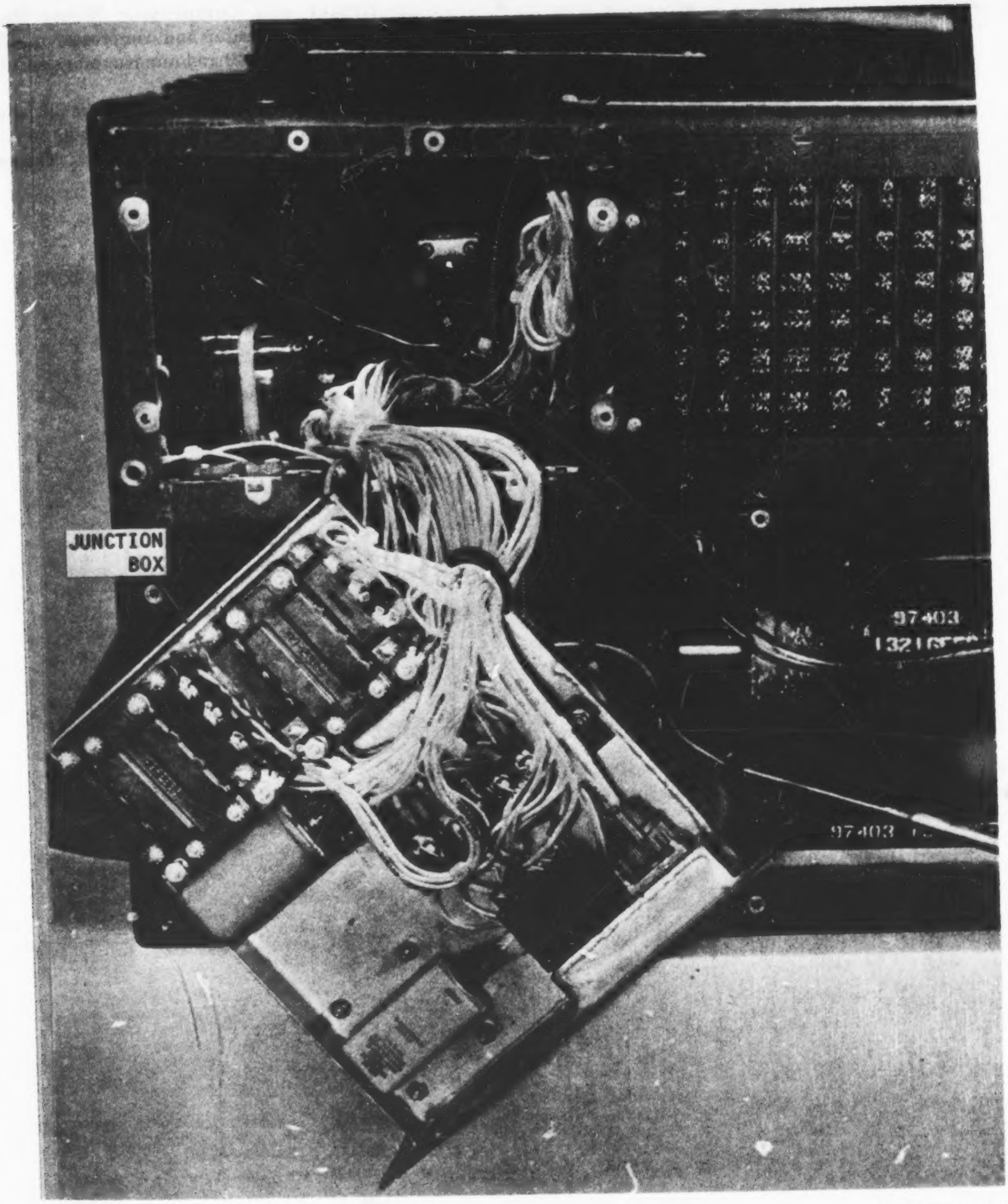
The junction box (Fig. 1-1) contains the time delay relay, control circuit breaker, condenser fan relay, heater relay, and the compressor motor relay.

a. Removal.

(1) Refer to figure 4-5 and remove front top cover. Refer to paragraph 4-42 and remove control module.

(2) Remove seven screws and lockwashers securing junction box to housing. Partially remove the junction box by pulling the box forward and out of the air conditioner. See figure 4-18. Support the junction box to relieve strain on wiring.

(3) To completely remove the junction box it is necessary to disconnect all the electrical leads and connectors.


JUNCTION BOX
97403
1321
97403

TS 4120-352-14/4-18

Figure 4-18. Junction box, partially removed.

b. ***Testing.*** Refer to schematic and wiring diagrams and test components for continuity after disconnecting leads. Check coils of armature relays for continuity then actuate the coil with a 24-volt dc source and check across contacts that should be closed according to the schedmatic diagram. Check circuit breaker in open and closed position.

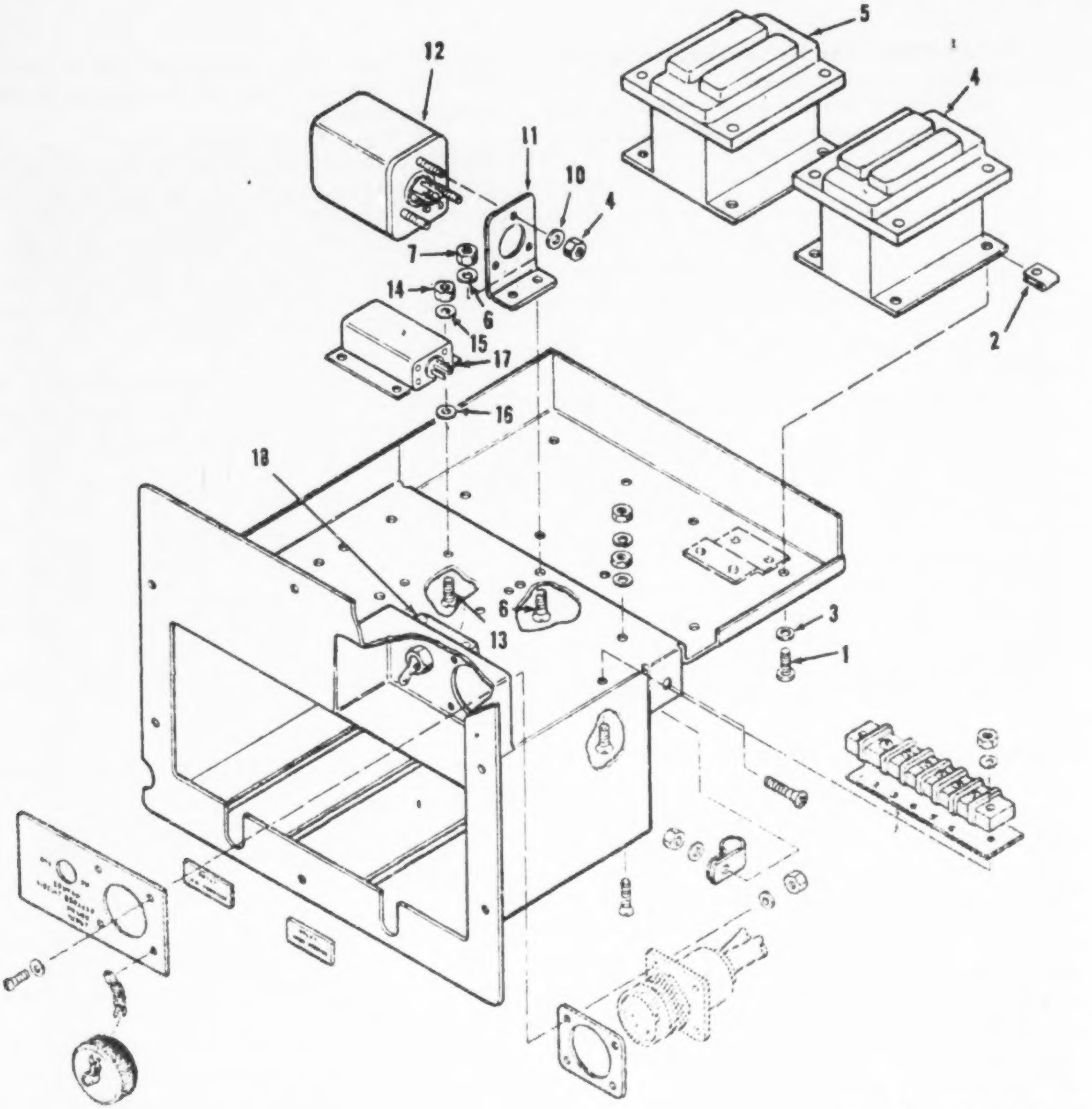
c. ***Disassembly.***

(1) **General.** Disassembly is limited to replacement of individual components. Tag and disconnect leads from components to be removed.

(2) **Heater and Compressor Motor Relays.** To remove the heater and compressor motor relays, refer to figure 4-19 and remove relays as follows.

(a) Remove four screws (1), nuts (2), and washers (3). Remove compressor motor relay (4).

(b) Follow same procedure to remove heater relay (5).



TS 4120-352-14/4-19

1 SCREW, PAN-HD, 10-32 X 5/8
2 NUT, HEX SLFLKG, 10-32
3 WASHER, FLAT, NO. 10
4 COMPRESSOR MOTOR RELAY
5 HEATER RELAY
6 SCREW, FL-HD, 6-32 X 1/2
7 NUT, HEX SLFLKG, 6-32
8 WASHER, FLAT, NO. 6 (.156 ID)
9 NUT, HEX, SLFLKG, 6-32
10 WASHER, FLAT, NO. 6 (.156 ID)
11 BRACKET
12 CONDENSER FAN RELAY
13 SCREW, FL-HD, 6-32 X 1/2
14 NUT, HEX, SLFLKG, 6-32
15 WASHER, FLAT, NO. 6(.156 ID)
16 WASHER, FLAT NO. 6 (.149 ID)
17 TIME DELAY RELAY
18 CIRCUIT BREAKER

Figure 4-19. Junction box components, exploded view.

(3) Condenser Fan Relay. Refer to figure 4-19 and remove relay as follows:

(a) Remove two screws (6), nuts (7), and flat washers (8). Remove relay and bracket from junction box.

(b) Remove three nuts (9) and flat washers (10) to separate bracket(11) from condenser fan relay (12).

(4) Time-Delay Relay. To remove the time delay relay, refer to figure 4-19 and remove relay as follows:

(a) Remove four screws (13), nuts (14), and washers (15).

(b) Remove relay (17) and two each of washers (15) and (16).

(5) Control Circuit Breaker. To remove the control circuit breaker (18, fig. 4-19), remove circuit breaker nut from front of junction box and pull breaker to the rear of the junction box.

d. Assembly.

(1) General. Refer to figure 4-19 and install any components that were removed. After installation of components, make all the necessary electrical connections.

(2) Control Circuit Breaker. Install control circuit breaker (18) through opening in junction box with locating projection in opening provided. Install breaker nut.

(3) Time Delay Relay. Install time delay relay (17) or junction box. Secure relay to junction box with four screws (13), nuts (14), and washers (15).

(4) Condenser Fan Relay. Install condenser fan relay (12) on bracket (11) and secure relay with three nuts (9) and flat washers (10). Install bracket on junction box and install two screws (6), nuts (7), and washers (8).

(5) Heater and Compressor Motor Relays. Install heater relay (5) or compressor motor relay (4) and secure relay with four screws (1), nuts (2) and flat washers (3).

e. Installation.

(1) Make any electrical connections that were disconnected during removal.

(2) Carefully install junction box into housing and install seven screws and lockwashers.

(3) Refer to paragraphs 4-42 and install control module.

(4) Refer to figure 4-5 and install top front cover.

Section XVII. MAINTENANCE OF TRANSFORMER, RECTIFIER, AND PRESSURE SWITCHES

4-44. General.

The power transformer and rectifier reduce the power voltage and convert the alternating currect to 24-volt direct currect to operate the coils and switches in the control circuit. The transformer is rated at a secondary voltage of 30 VAC with a primary voltage of 120 VAC. The transformer and rectifier are located below the junction box. The high and low pressure cutout switches are also located below the junction box with the reset buttons extending through the front of the housing. The pressure cutout switches are connected in the refrigeration system and are electrically connected in the control system to the compressor motor relay coil. Extreme high or low pressure opens the circuit causing the compressor to stop.

4-45.

a. Testing. Test transformer as follows:

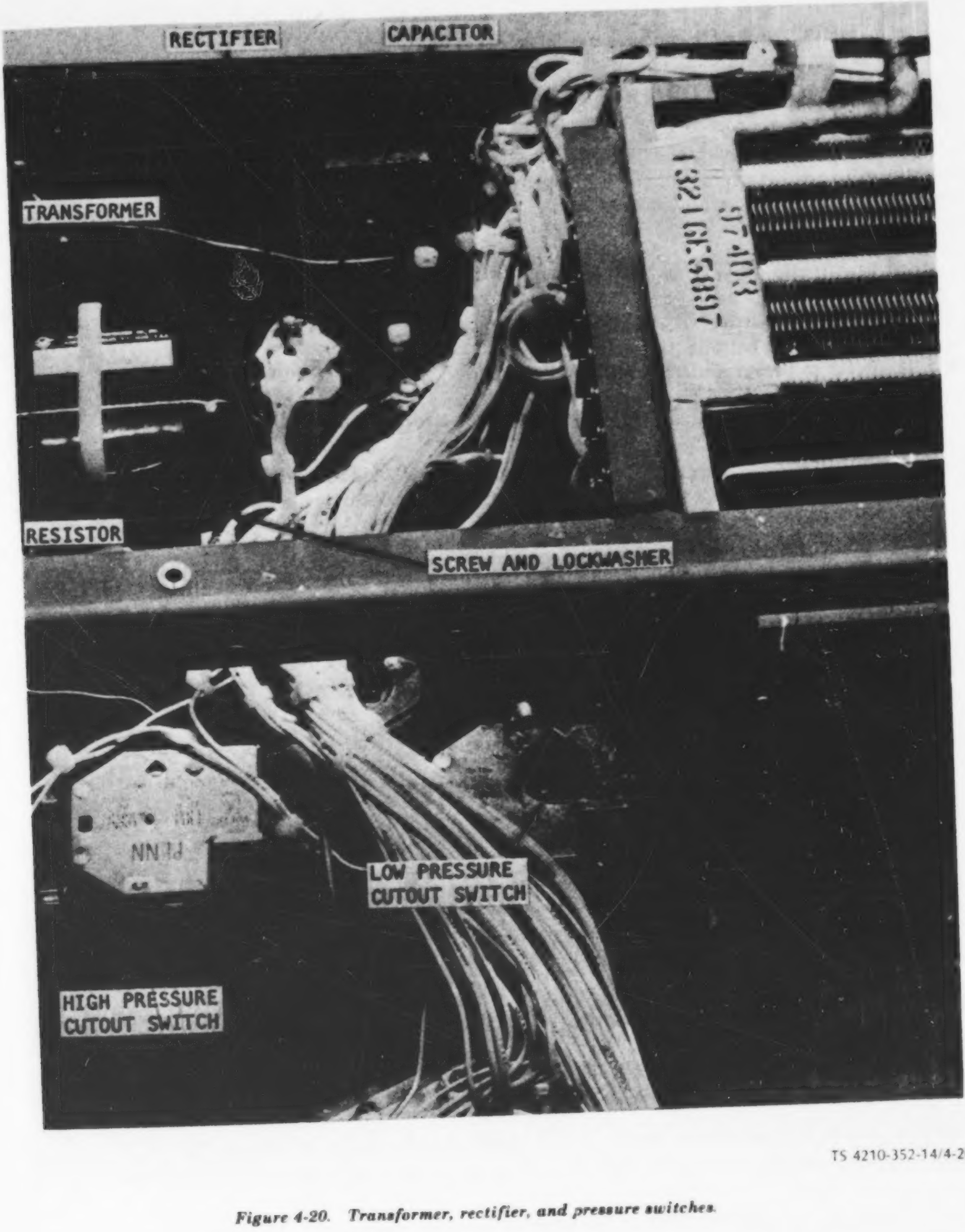
(1) Refer to figure 4-5 and remove top cover. Refer to paragraph 4-43 and partially remove junction box.

(2) Disconnect leads and check for continuity across the primary winding and then across the secondary winding. If eighter winding is open, replace the transformer.

(3) Check for grounds between one terminal of each winding and transformer case and for shorts between one primary terminal and one secondary terminal using an insulation tester, megger or multimeter on high ohms setting. Replace transformer if a short or ground is indicated.

b. Removal. With junction box removed, rerfer to figure 4-20 and remove four screws and lockwashers. Disconnect and remove transformer.

c. Installation. Refer to figure 4-20 and install transformer, four screws, and four lockwashers. Connect leads. Refer to paragraph 4-43 and install junction box.


RECTIFIER
CAPACITOR
TRANSFORMER
RESISTOR
SCREW AND LOCKWASHER
LOW PRESSURE CUTOUT SWITCH
HIGH PRESSURE CUTOUT SWITCH
PENN
974403
1321GE5897

TS 4210-352-14/4-20

Figure 4-20. Transformer, rectifier, and pressure switches.

4-46. Rectifier.

*a. **Removal.*** Remove rectifier as follows:

(1) Refer to paragraph 4-43 and remove junction box.

(2) Refer to figure 4-20 and remove filter capacitors. Disconnect leads.

(3) Remove two cap screws and remove rectifier.

*b. **Testing.*** Apply a 30 volt ac source of power across the no. 1 and 3 terminals. Check for 24 to 28 volt dc output across terminals 2 and 4. Replace rectifier if defective.

*c. **Installation.*** Refer to figure 4-20 and install rectifier as follows:

(1) Install rectifer and two cap screws.

(2) Connect leads and install capacitors: the .056 mfd capacitor between rectifier terminals 1 and 3; the 10,000 pfd between terminals 2 and 4.

(3) Refer to paragraph 4-43 and install junction box.

4-47. High and Low Pressure Cutout Switches.

*a. **General.*** The high and low pressure cutout switches cannot be removed without opening the refrigeration syste,. Electrical tests should be made with the switches installed.

*b. **Testing.*** Test switches as follows:

(1) Refer to paragraph 4-43 and remove junction box.

(2) Disconnect leads and test for continuity across terminals of switch. If no continuity is indicated, press reset button and recheck.

(3) If switch is defective, report condition to direct support maintenance.

(4) If switch is not defective, connect leads and install junction box.

Section XVIII. MAINTENANCE OF COMPRESSOR

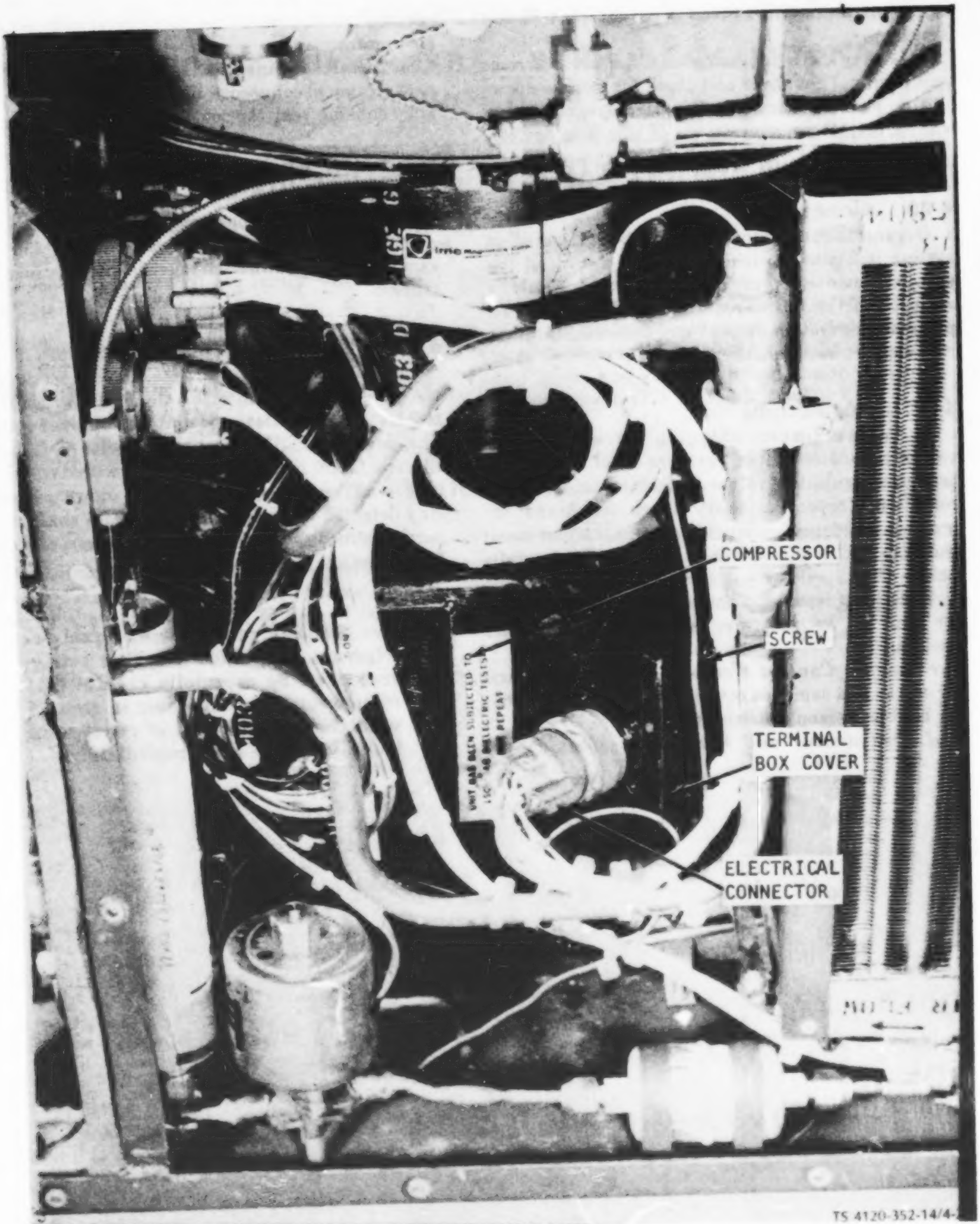
4-48. General.

Organizational maintenance of the compressor is limited to the inspection, testing and repair of the electrical equipment.

4-49. Inspection, Testing and Repair.

a. Refer to figure 4-5 and remove housing rear top cover.

b. Refer to figure 4-21 and disconnect electrical connector.


COMPRESSOR
SCREW
TERMINAL BOX COVER
ELECTRICAL CONNECTOR

TS 4120-352-14/4-

Figure 4-21. Compressor, electrical connector and terminal box cover.

c. Follow procedure given in paragraph 4-37 and test motor.

d. If any difficulty is indicated, remove screws and terminal box cover and check for damaged wiring or loose connections. Repair damaged wiring and tighten loose connections. If this does not correct the trouble, report the conditioner to direct support maintenance.

e. Install terminal box cover and scrrews. Connect electrical connecotr. Refer to figure 4-5 and install housing rear top cover.

Section XIX. MAINTENANCE OF REFRIGERATION SYSTEM

4-50. General.

Organizational maintenance of the refrigeration system is limited to inspection and testing of the system. Remove top covers, louvers and partilally remove junction box as required to gain access to all parts of the system. Report any deficiencies to direct support maintenance.

4-51. Inspection.

*a. **Valves.*** Inspect charging valves, solenoid valves, expansion valves, pressure relief valves and pressure regulating valves for cracks or damaged condition. Inspect capillary tubes for kinks or breaks. Disconnect solenoid valve electrical connectors and check for coil continuity between terminals.

*b. **Coils.*** Inspect condenser and evaporator coils for bent or broken fins and for damaged connections.

*c. **Louver Control Actuator.*** Inspect cylinder for cracks and damaged connections. Inspect control for bent or broken conditions.

*d. **Dehydrator and Receiver.*** Inspect dehydrator and receiver for damage.

*e. **Tubing and Fittings.*** Inspect tubing for kinks, cracks or other damage. Inspect fittings for cracks.

4-52. Testing System for Leaks.

Check all piping, components, and connections of the refrigerant system with a General Electric Type H-2 Halogen Test Detector unit (or approved equal). The detector shall be calibrated with a General Electric LS-20 leak standard (or approved equal for a pure refrigerant leak rate of 0.1 ounce per year. Any detected leaks exceeding this rate shall be reported immediately to direct support maintenance for correction and recharging.

WARNING

Avoid bodily contact with liquid refrigerant and avoid inhaling refrigerant gas. Be especially careful that refrigerant does not come in contact with the eyes. In case of refrigerant leaks, ventilate area immediately.

CHAPTER 5

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE INSTRUCTIONS

Section I. REPAIR PARTS, SPECIAL TOOLS AND EQUIPMENT

5-1. Tools and Equipment

No tools or equipment are issued with the air conditioner.

5-2. Special Tools and Equipment

No special tools or equipment are required for maintenance of the air conditioner.

5-3. Maintenance Repair Parts

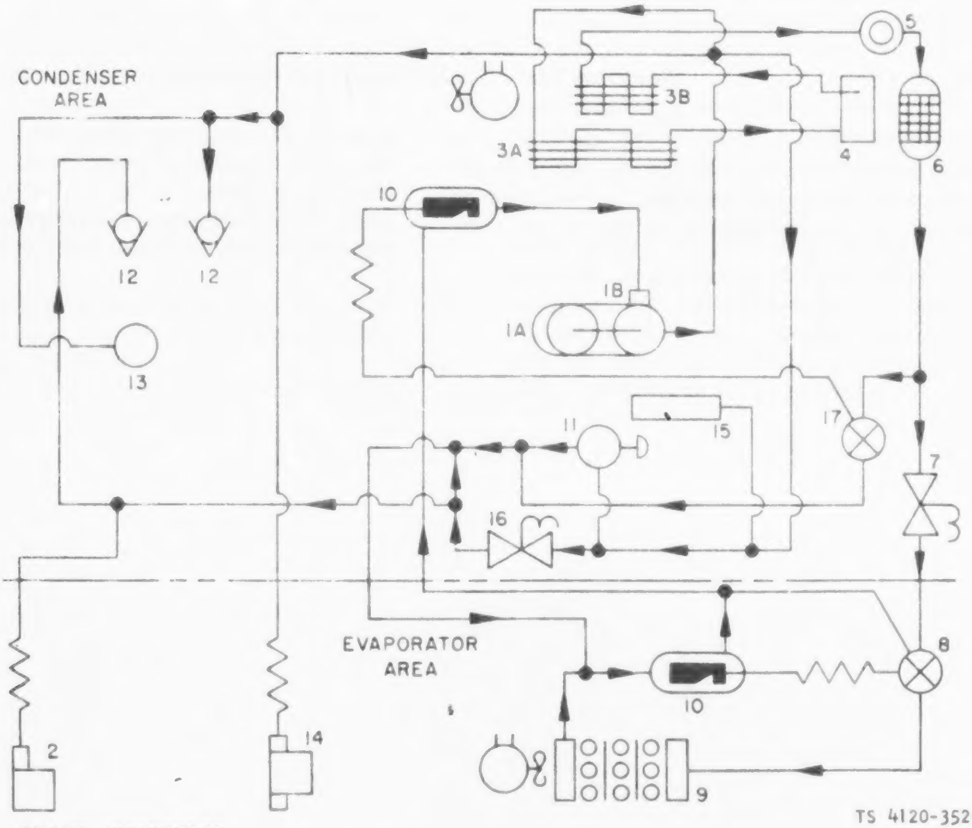
Repair parts and equipment are listed and illustrated in the repair parts and special tool list covering direct and general support maintenance for this equipment. (TM 5-4120-352-24P)

Section II. TROUBLESHOOTING

5-4. General

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the air conditioner or any of its components. Electrical schematic and wiring diagrams shown in figure 1-4 and 1-5 will be helpful for checking electrical circuits. A refrigerant flow diagram is shown in figure 5-1. System pressure test instructions are in paragraph 6-2.

FIND NO.	PART NO.	QTY	NOMENCLATURE
1	13208E4182	1	COMPRESSOR, RECIPROCATING
2	13216E6215-1	1	SWITCH, PRESSURE (LOW)
3A	13216E5904	1	COIL, CONDENSER WITH ANGLE
3B	PT OF FIND NO. 3A	1	SUBCOOLER
4	13216E6163-1	1	RECEIVER, LIQUID REFRIGERANT
5	13216E6155	1	INDICATOR, SIGHT, LIQUID
6	13216E5918-1	1	DEHYDRATOR, DESICCANT, REFRIGERANT
7	13216E6172-1	1	SOLENOID VALVE WITH LEADS
8	13216E6160-1	1	VALVE, EXPANSION (PRIMARY)
9	13216E5897	1	COIL EVAPORATOR WITH ANGLE
10	13216E5921	2	BULB WELL
11	13216E6171	1	REGULATOR, FLUID PRESSURE
12	13219E9499	2	VALVE, CHARGING, WITH CAP
13	13211E8369	1	VALVE, PRESSURE RELIEF
14	13216E6215-3	1	SWITCH, PRESSURE (HIGH)
15	13216E6128	1	CYLINDER ASSY, ACTUATING, LINEAR
16	13216E6172-2	1	SOLENOID VALVE WITH LEADS
17	13216E6174-1	1	VALVE, EXPANSION (QUENCH)



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TS 4120-352-14/5-1

Figure 5-1. Refrigerant Flow Diagram

5-5. Troubleshooting Chart

Troubleshooting procedures for direct and general support maintenance are listed in table 5-1. Each trouble symptom or malfunction stated is followed by a step-by-step procedure for inspecting and testing the system to determine the specific cause of fault or failure. The corrective active recommended follows the determination of probable cause.

Table 5-1. ***Troubleshooting***

Malfunction
Test or Inspection
Corrective Action

---

1. COMPRESSOR WILL NOT START

Step 1. Test for an open-circuit condition in the control circuit by means of a continuity check.
Replace component or wire causing open circuit (para 4-12).

Step 2. Test circuit breaker for defective operation.
Replace defective circuit breaker (para 4-43).

Step 3. Check to see if high or low pressure cutout switch is defective.
Replace defective switch (para 5-21).

Step 4. Check to see if compressor motor or thermal protectors are defective.
Replace compressor (para 5-17).

2. COMPRESSOR STARTS BUT IMMEDIATELY STOPS

Step 1. Check to see if thermal protector or circuit breaker is tripped.
Reset circuit breaker, or allow thermal protector to cool and reset. If condition repeats, replace compressor (para 5-17).

3. LITTLE OR NO HEATING CAPACITY.

Step 1. Check for loose electrical connections or faculty wiring.
Repair or replace wiring as necessary (para 4-33).

Step 2. Test mode selector switch and temperature selector for faulty closure in heat control circuit.
Replace defective switch (para 4-42).

Step 3. Test heater relay for faulty contact closure.
Replace defective relay (para 4-43).

Step 4. Test for defective operation of heater high temperature cutout.
Replace defective thermostatic switch (para 4-34).

Step 5. Test heater for open-circuited element.
Replace defective heaters (para 4-35).

Table 5-1. Troubleshooting (cont'd)

Malfunction
Test or Inspection
Corrective Action

---

4. INSUFFICIENT COOLING

Step 1. Test for low refrigerant charge.
Add refrigerant (para 6-3).

Step 2. Check for indications of a clogged dehydrator.
Replace clogged dehydrator (para 4-43).

Step 3. Check for indications of a defective pressure regulator valve.
Replace defective valve (para 5-30).

Step 4. Check for indications of air in system.
Purge and charge system (fig. 6-1).

Step 5. Check for indications of a defective thermal expansion valve.
Replace defective valve (para 5-28).

Step 6. Check for indications of defective solenoid valve.
Replace defective solenoid valve (para 5-27).

Step 7. Check for indications of defective quench valve.
Replace defective valve (para 5-29).

5. LOW SUCTION PRESSURE

Step 1. Check for indications of a clogged dehydrator.
Replace clogged dehydrator (para 5-24).

Step 2. Check for indications of a defective thermal expansion valve.
Replace defective valve (para 5-28).

Step 3. Check for indications of a defective quench valve.
Replace defective valve (para 5-29).

6. LOW DISCHARGE PRESSURE

Step 1. Check to see if compressor is not pumping due to defect.
Replace defective compressor (para 5-17).

Step 2. Check to see if HIGH LOW condenser fan thermostatic switch is defective.
Replace defective switch (para 4-39).

Table 5-1. Troubleshooting (cont'd)

Malfunction
Test or Inspection
Corrective Action

---

7. LOW SUCTION AND DISCHARGE PRESSURE

Step 1. Check for low refrigerant charge by inspecting sight glass for bubbles or milky appearances. Also check system for leaks.
Repair leaks and add refrigerant as necessary.

Step 2. Check for indications of defective thermal expansion valve.
Replace valve (para 5-28).

Step 3. Check for indications of defective quench valve.
Replace valve (para 5-29).

8. HIGH SUCTION PRESSURE

Step 1. Check for indications of defective thermal expansion valve.
Replace valve (para 5-28).

Step 2. Check for indications of defective quench valve.
Replace valve (para 5-29).

9. HIGH HEAD PRESSURE

Step 1. Check to see if condenser coil is dirty.
Clean coil.

Step 2. Check condenser coil temperature gradient for indications of refrigerant overcharge.
Discharge refrigerant (fig. 6-1) while observing head pressure and sight glass.

Step 3. Inspect or test condenser fan motor for defective operation.
Repair motor (para 6-8).

Step 4. Inspect condenser louvers and actuating mechanism for correct adjustment and proper operation.
Adjust and clean as necessary. Replace inoperative components (para 5-20).

Step 5. Check for indications of defective quench valve.
Replace defective valve (para 5-29).

Step 6. Check to see if the compressor is defective.
Replace defective compressor (para 5-17).

Section III. GENERAL MAINTENANCE INSTRUCTIONS

5-6. General.

This section contains general repair instructions which would otherwise have to be repeated several times.

5-7. Refrigeration System.

a. Opening System. When the refrigeration system must undergo maintenance that requires the system to be opened for removal of parts, the system must first be discharged and purged (para 6-3). After the repair has been made and all soldering completed, the system must be charged (para 6-3) and tested for leaks.

b. Removal of parts. It may be necessary to remove some tubing and fittings along with a part that is to be replaced. The tubing and fittings can then be removed from the defective part and installed in the new part. Care should be exercised in opening joints or resoldering to prevent damage to other parts of the air conditioner.

c. Brazing. Braze copper-to-copper joints with silver solder type 3, 4 or 6A specification QQ-S-561 and copper-to-brass or copper-to-steel with type 4 or 6A specification QQ-S-561 per MIL-B-7883. Solder melting point is 1160°F (625°C). All brazed or soldered joints shall be made with an atmosphere of inert gas to prevent internal oxidation.

5-8. Insulation and Gaskets.

Replace damaged insulation and gaskets. Cement loose insulation.

5-9. Hardware.

Replace any damaged screw, washers, lock washers or nuts. Use screws of correct length to hold parts securely. In some applications screws that are too long may hit bottom before the head is tight against part it is to hold or may cause damage to the threads or other parts.

5-10. Shims.

Be sure to remove all shims where used. Keep shims together and identify them as to location.

5-11. Repairing Damaged Threads.

Damaged threads should be repaired by use of a thread restorer or by chasing in a lathe. Internal threads should be repaired with a tap of the correct size. If threads cannot be satisfactorily repaired, replace the part.

5-12. Repair of Damaged Machined and Polished Surfaces.

Smooth rough spots, scores, burrs, galling, and gouges from damaged machined and polished surfaces so that part will efficiently perform its normal function. The finish of the repaired part is to approximately that of the original finish. In performing any of these operations, critical dimensions must not be altered.

5-13. Removal of Rust or Corrosion.

Remove corrosion from all parts of material. To remove rust or corrosion, use wire brush, abrasive cloth, sand blast, vapor blast equipment, or rust remover except on highly polished surfaces. On these surfaces, buffing or the use of the use of crocus cloth is recommended.

5-14. Tubes and Fittings.

Check tubes and fittings for cracked or split condition. Check tubing for kinks. Replace defective fittings. Replace damaged tubing with tubing of same size. Take care in making bends in tubing to prevent kinking of tubing. All tubing and fittings must be completely clean on inside prior to installation.

5-15. Valves.

Valves and other parts should be handled carefully to prevent damage. Capillary tubes must be handled very carefully to prevent kinking of the tubes.

Section IV. REMOVAL AND INSTALLATION OF MAJOR COMPONENTS AND ASSEMBLIES

5-16. General.

This section covers removal of all major assemblies of the air conditioner which are the responsibility of the direct support and general support maintenance. The refrigerant piping and valves cannot be removed as a unit and only those parts that require replacement shoudl be removed. Removal and installation instructions for individual valves and other components of the refrigeration system are contained in this section. Refer to paragraph 5-7 before performing maintenance on the refrigeration system.

5-17. Compressor.

a. ***General***. The compressor is a self-contained hermetically sealed unit and cannot be repaired.

b. ***Removal***. Remove compressor as follows:

(1) Refer to paragraph 6-3 and discharge the refrigerant system.

(2) Refer to figure 4-5 and remove top covers.

(3) Refer to figure 5-2 and disconnect electrical connector.

(4) Disconnect tubing as required to permit removal of compressor.

(5) Remove four screws, washers, lock washers and compressor mount bushings.

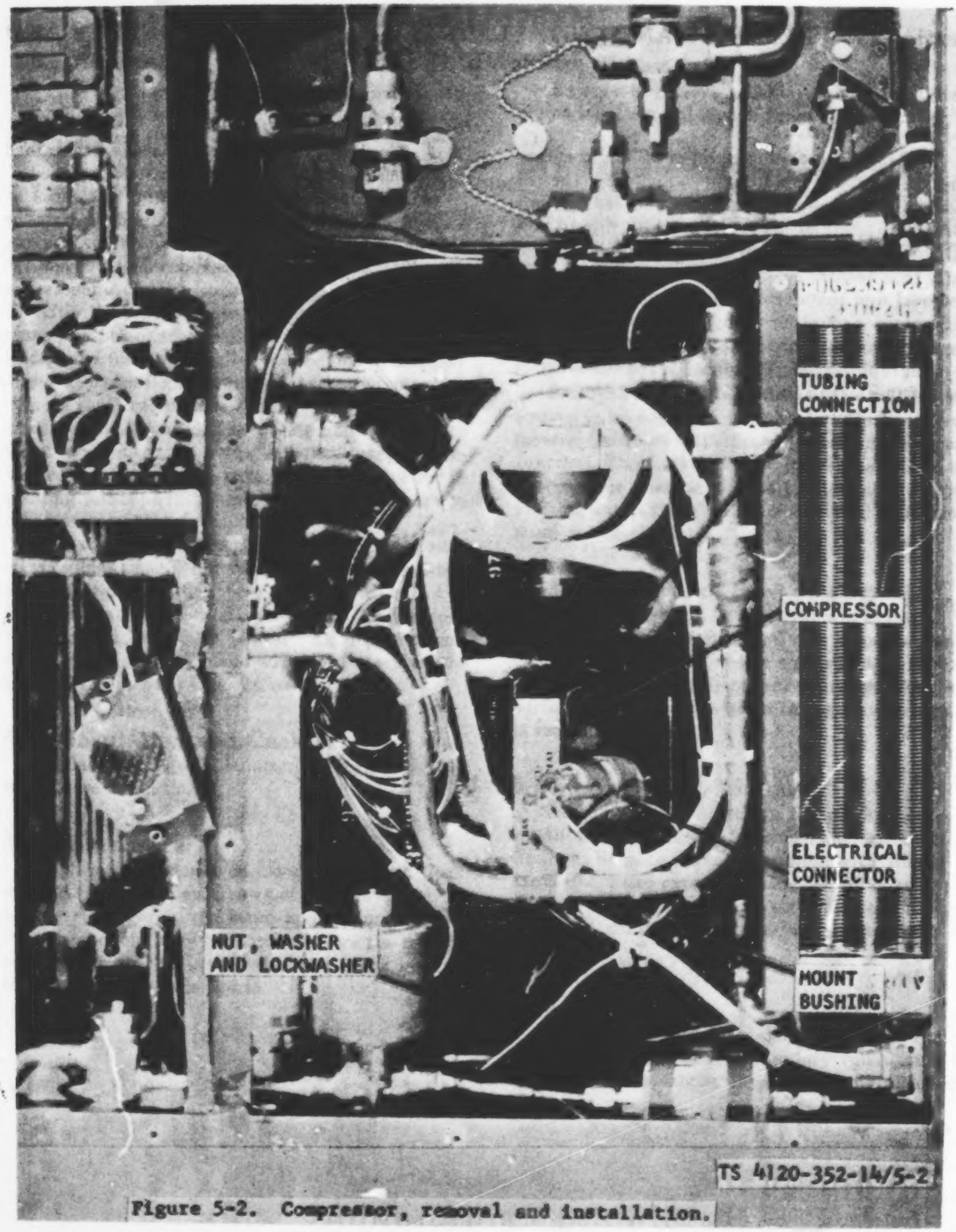

TUBING CONNECTION
COMPRESSOR
ELECTRICAL CONNECTOR
MOUNT BUSHING
NUT, WASHER AND LOCKWASHER
TS 4120-352-14/5-2

Figure 5-2. Compressor, removal and installation.

(6) Lift compressor from air conditioner.

CAUTION

If compressor is being replaced because of a motor burnout, decontaminate system as instructed in paragraph 6-5. Failure of the replacement compressor will result if all the contaminants are not removed.

*c. **Installation***. Refer to figure 5-2 and install compressor as follows:

(1) Place compressor on mounts and install four compressor mount bushings. Secure compressor with four screws, washers and lock washers.

(2) Connect tubing.

(3) Connect electrical connector.

(4) Refer to figure 4-5 and install housing top covers.

(5) Refer to paragraph 6-3 and discharge the refrigerant system.

5-18. Evaporator Coil and Mist Eliminator Holder.

a. Removal. Remove the evaporator coil and mist eliminator holder as follows:

(1) Refer to paragraph 6-3 and discharge the refrigerant system.

(2) Refer to figure 4-5 and remove housing top covers.

(3) Refer to figure 4-2 and remove evaporator air outlet louvers and mist eliminator.

(4) Refer to figure 5-3 and disconnect tubing from evaporator coil.

(5) Remove six screws, washers, and lock washers and lift evaporator coil and angle; also mist eliminator holder, from air conditioner.

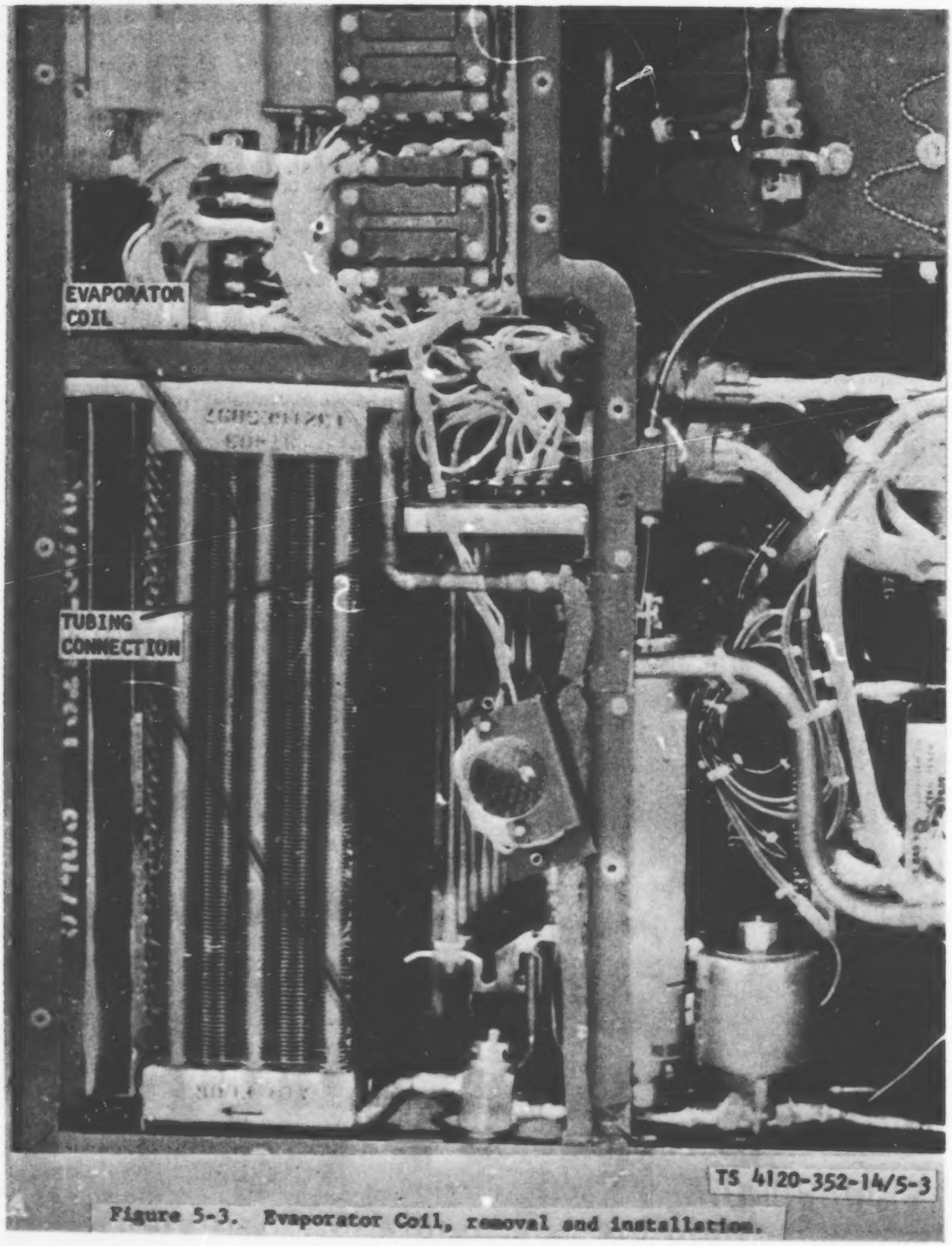

EVAPORATOR COIL
TUBING CONNECTION
TS 4120-352-14/5-3

Figure 5-3. Evaporator Coil, removal and installation.

*b. **Installation.*** Install evaporator coil and mist eliminator holder as follows:

(1) Install coil and mist eliminator holder in air conditioner and secure to brackets with six screws, washers, and lock washers. The lower four screws, washers and lockwashers attach both the coil and mist eliminator holder; the upper two hold the coil only.

(2) Connect tubing to coil.

(3) Refer to figure 4-2 and install evaporator air outlet louver.

(4) Refer to figure 4-5 and install housing top covers.

(5) Refer to figure 6-2 and charge the refrigerant system.

5-19. Condenser Coil.

a. Removal. Remove condenser coil as follows:

(1) Refer to figure 6-1 and discharge the refrigeran system.

(2) Refer to figure 4-5 and remove housing top covers.

(3) Refer to figure 5-4 and remove screw that secures bulb well loop clamp to condenser coil angle

(4) Disconnect tubing from condenser coil and remove other tubing and fittings as required.

(5) Refer to figure 4-3 and remove condenser guard.

(6) Remove four countersunk-head screws that secure coil to base of housing.

(7) Remove coil from air conditioner. Use care when removing coil to prevent damage to coils and fins.

(8) To remove angle from coil, grind off four rivets.

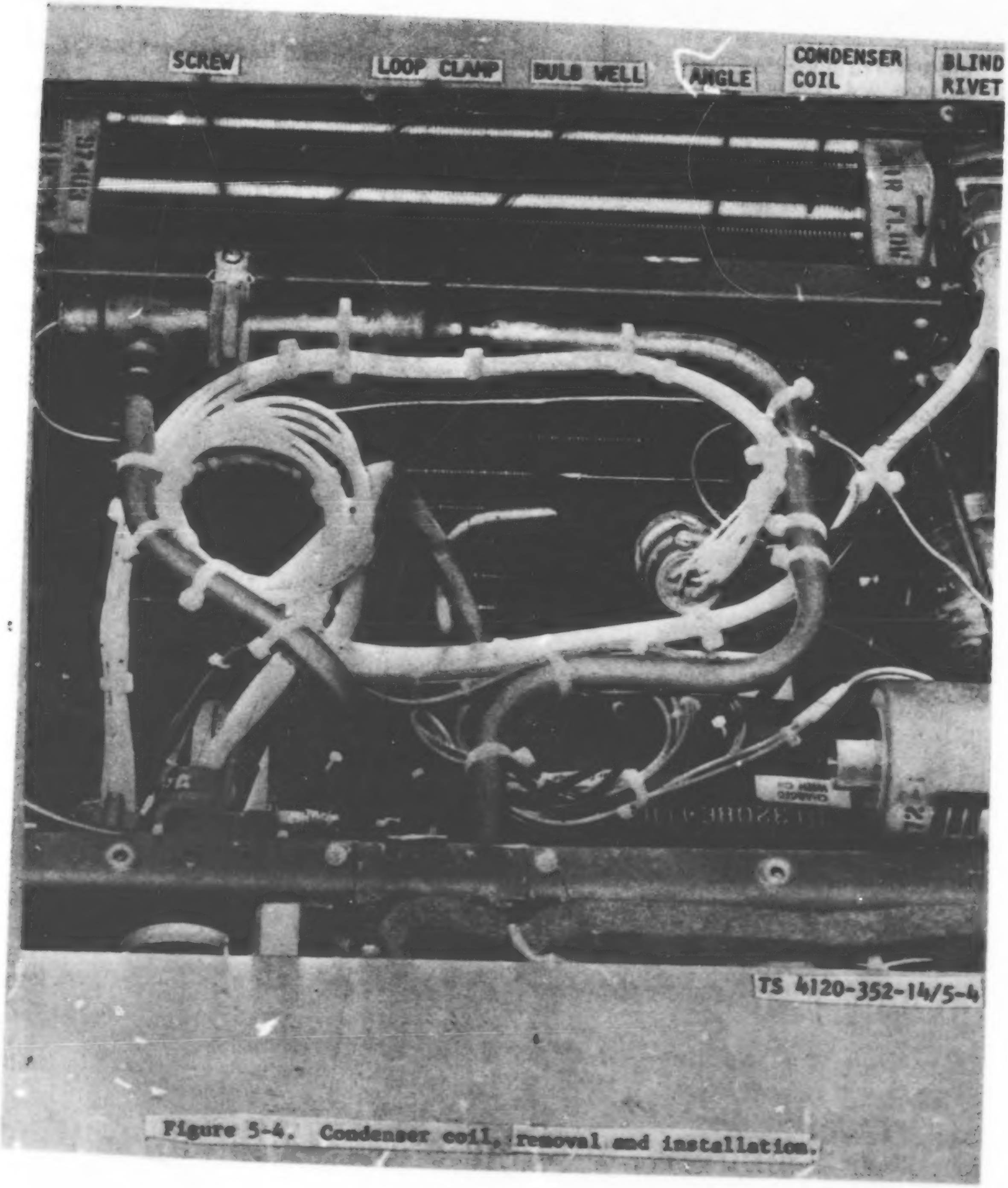

SCREW
LOOP CLAMP
BULB WELL
ANGLE
CONDENSER COIL
BLIND RIVET
AIR FLOW
TS 4120-352-14/5-4

Figure 5-4. Condenser coil, removal and installation.

*b. **Installation.*** Install condenser coil as follows:

(1) If angle was removed from condenser, rivet angle to coil with four blind rivets.

(2) Be sure sheet spring nuts are in place on bottom of coil. Position coil in air conditioner and install four countersunk-head screws from underside of housing.

(3) Refer to figure 4-3 and install condenser guard.

(4) Connect tubing to condenser and install any other tubes and fittings that

(5) Attach bulb well clamp to angle with screw.

(6) Refer to figure 4-5 and install housing top covers.

(7) Refer to figure 6-2 and charge the refrigerant system.

5-20. Condenser Louver Actuator and Control.

*a. **Removal.*** Remove actuator and push-pull control as follows:

(1) Refer to figure 6-1 and discharge the refrigerant system.

(2) Refer to figure 4-5 and remove housing covers.

(3) Refer to figures 5-5 and 5-6 and loosen mechanical post screws to loosen control wire.

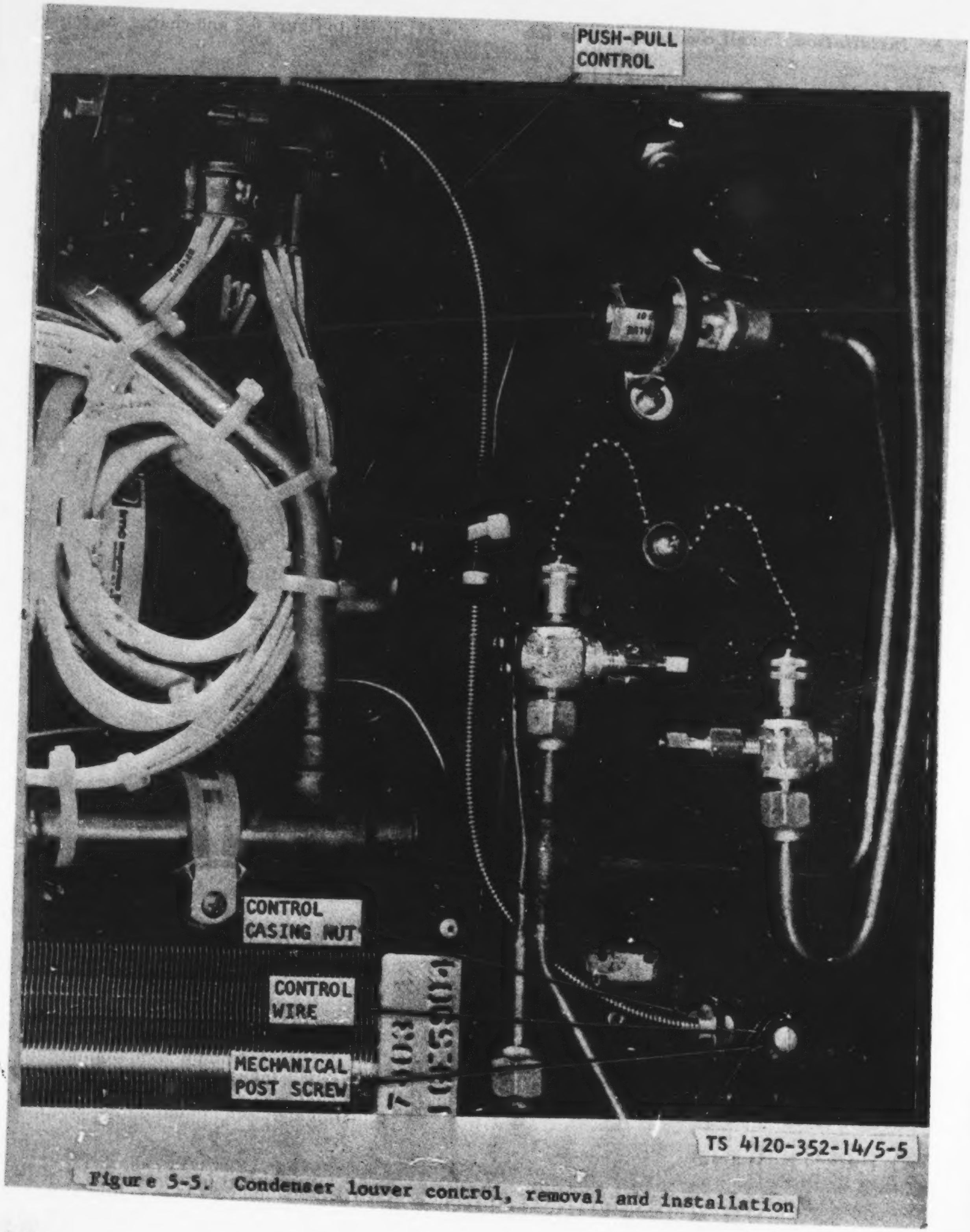

PUSH-PULL CONTROL
CONTROL CASING NUT
CONTROL WIRE
MECHANICAL POST SCREW
TS 4120-352-14/5-5

Figure 5-5. Condenser louver control, removal and installation

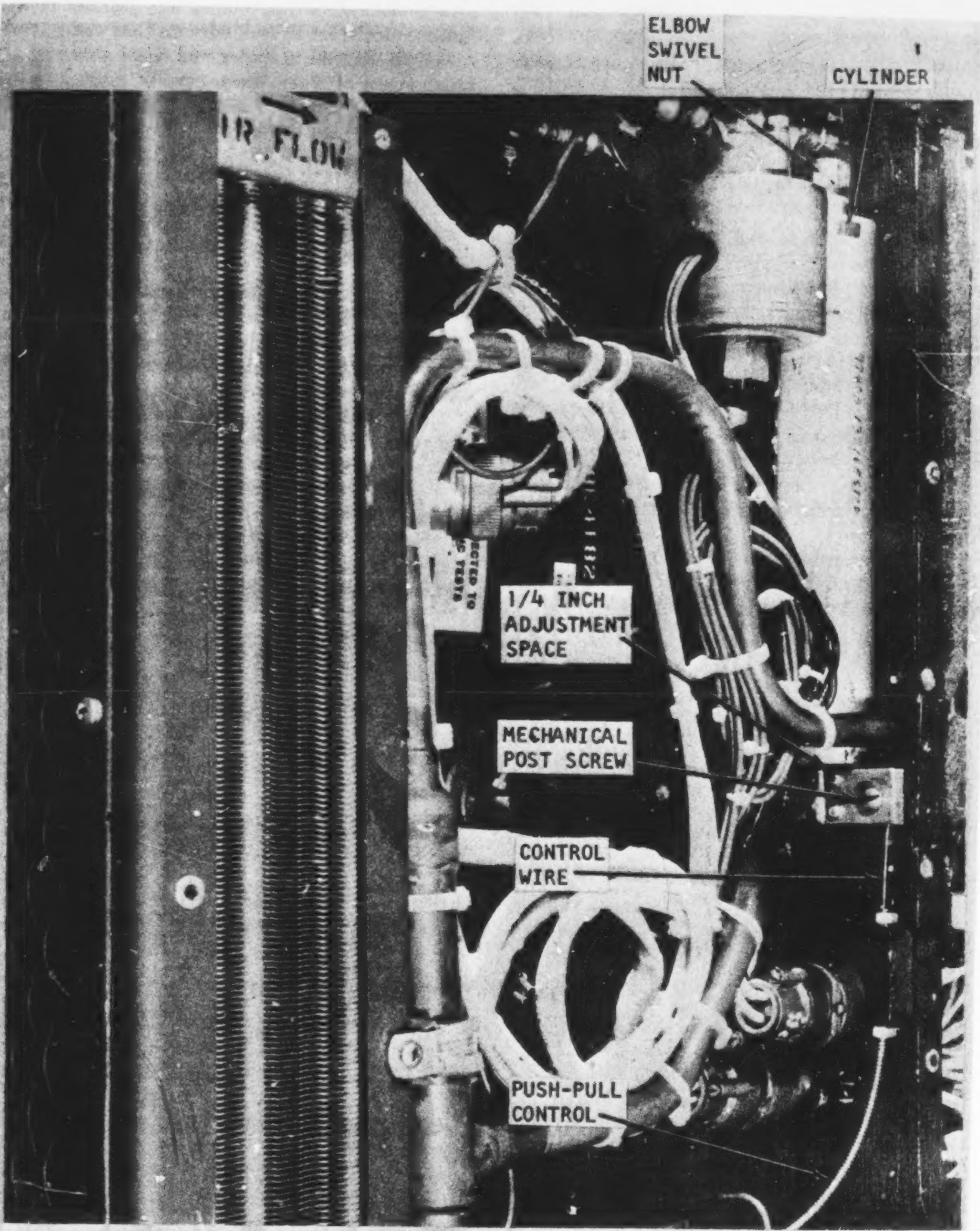

ELBOW
SWIVEL
NUT
CYLINDER
IR FLOW
1/4 INCH
ADJUSTMENT
SPACE
MECHANICAL
POST SCREW
CONTROL
WIRE
PUSH-PULL
CONTROL
TS 4120-352-14/5-6

Figure 5-6. Condenser louver actuator cylinder, removal and installation.

best copy available

(4) Remove screw, lock washer and loop clamp.

(5) Remove control casing outer nuts at each end and remove push-pull control.

(6) Disconnect elbow swivel nut from end of actuator cylinder.

(7) Remove two nuts and lock washers from evaporator side of partition and remove actuator cylinder.

*b. **Installation.*** Install actuator cylinder and control as follows:

(1) Install actuator cylinder (fig. 5-6) with studs through openings in partition. Install lock washers and nuts on studs.

(2) Connect elbow swivel nut.

(3) Install push-pull control. Place outer control casing nuts (fig. 5-5) over wire and insert wire ends into openings in mechanical posts on louver lever and actuator cylinders.

(4) Install control casing nuts on casing to hold control in position. Install loop clamp, screw, and lock washer.

(5) Adjust control as described in *c* below.

*c. **Adjustment.*** Before system is charged, adjust louver push-pull control as follows:

(1) Close louver blades and tighten screw in mechanical post to lock wire on that end.

(2) Extend actuator rod until there is a 1/4 inch space between inner edge of mechanical post bracket and the face of the cylinder. Tighten the mechanical post screw.

(3) Refer to figure 4-5 and install housing top covers.

(4) Refer to figure 6-2 and charge the refrigerant system.

5-21. Pressure Switches.

*a. **Removal.*** Remove pressure cutout switches (fig. 4-20) as follows:

(1) Refer to figure 6-1 and discharge the refrigeration system.

(2) Refer to paragraph 4-43 and remove junction box. Disconnect electrical leads. Refer to figure 4-5 and remove housing rear and center top covers.

(3) Remove two mounting screws and lock washers from each switch.

(4) Refer to figure 5-7 and disconnect capillary tube nuts. Remove grommet and pull capillary tubes through partition.

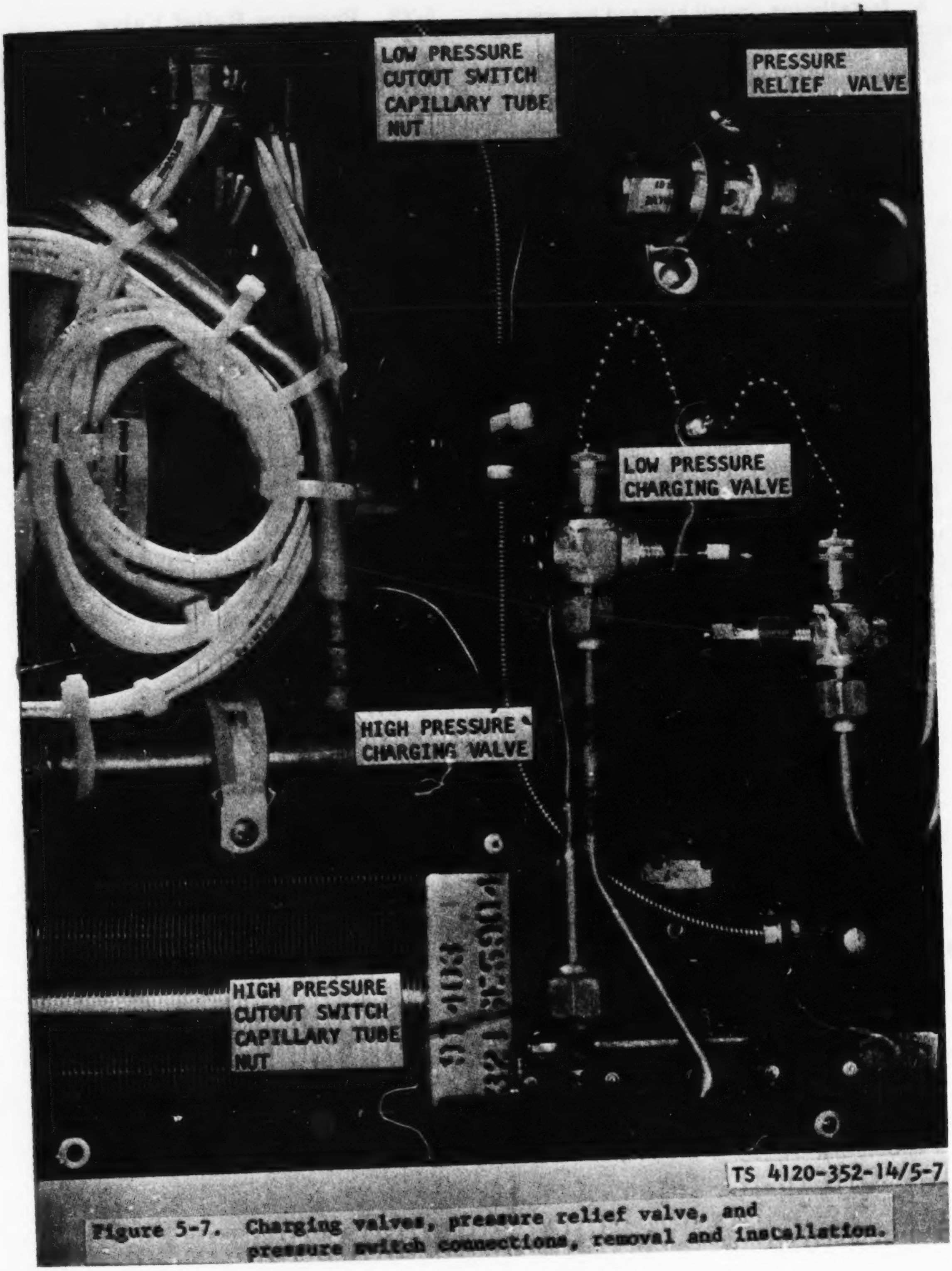

LOW PRESSURE CUTOUT SWITCH CAPILLARY TUBE NUT
PRESSURE RELIEF VALVE
LOW PRESSURE CHARGING VALVE
HIGH PRESSURE CHARGING VALVE
HIGH PRESSURE CUTOUT SWITCH CAPILLARY TUBE NUT
TS 4120-352-14/5-7

Figure 5-7. Charging valves, pressure relief valve, and pressure switch connections, removal and installation.

b. ***Installation.*** Install high and low pressure cutout switches as follows:

(1) Insert capillary tube ends through partition and install grommet (fig. 5-7). Connect capillary tube nuts to fittings.

(2) Install switches (fig. 4-20) and secure each with two screws and lock washers.

(3) Make electrical connections to switches.

(4) Refer to paragraph 4-43 and install junction box. Refer to paragraph 4-21 and install housing top cover.

(5) Refer to figure 6-2 and charge the refrigerant system.

5-22. Service Valves.

a. ***Removal.*** Refer to figure 6-1 and discharge the refrigerant system. Remove housing rear top covers (figures 4-5). Detach valve cap chain by removing a screw, lockwasher and flat washers. Remove valve by removing two base mounting screws.

b. ***Installation.*** Mount valve to bracket, using two screws. Affix loops in cap chains to housing with a screw, lockwasher and two flat washers. Connect valves to refrigerant lines by tightening flare nuts. Refer to figure 4-5 and install housing rear top cover. Refer to figure 6-2 and charge the refrigerant system.

5-23. Pressure Relief Valve.

a. ***Removal.*** Refer to figure 6-1 and discharge the refrigerant system. Refer to figure 4-5 and remove housing top covers. Remove screw, lockwasher, and loop clamp (fig. 5-7). Remove pressure relief valve from adapter.

b. ***Installation.*** Install pressure relief valve (fig. 5-7) in adapter. Install loop clamp on valve and secure clamp with screw and lockwasher. Install housing top cover (fig. 4-5). Refer to paragraph 6-3 and charge the refrigerant system.

5-24. Dehydrator.

a. ***General.*** The dehydrator is to be replaced whenever the refrigeration system is opened for maintenance.

b. ***Removal.*** Refer to figure 6-1 and discharge the refrigerant system. Refer to figure 4-5 and remove housing rear top cover. Refer to figure 5-8 and remove four screws and two straps. Disconnect and remove dehydrator.

c. ***Installation.*** Connect dehydrator to tubing. Install two straps and four screws. Use sealing compound on screw threads. Install rear top cover (figure 4-5). Refer to figure 6-2 and charge the refrigerant system.

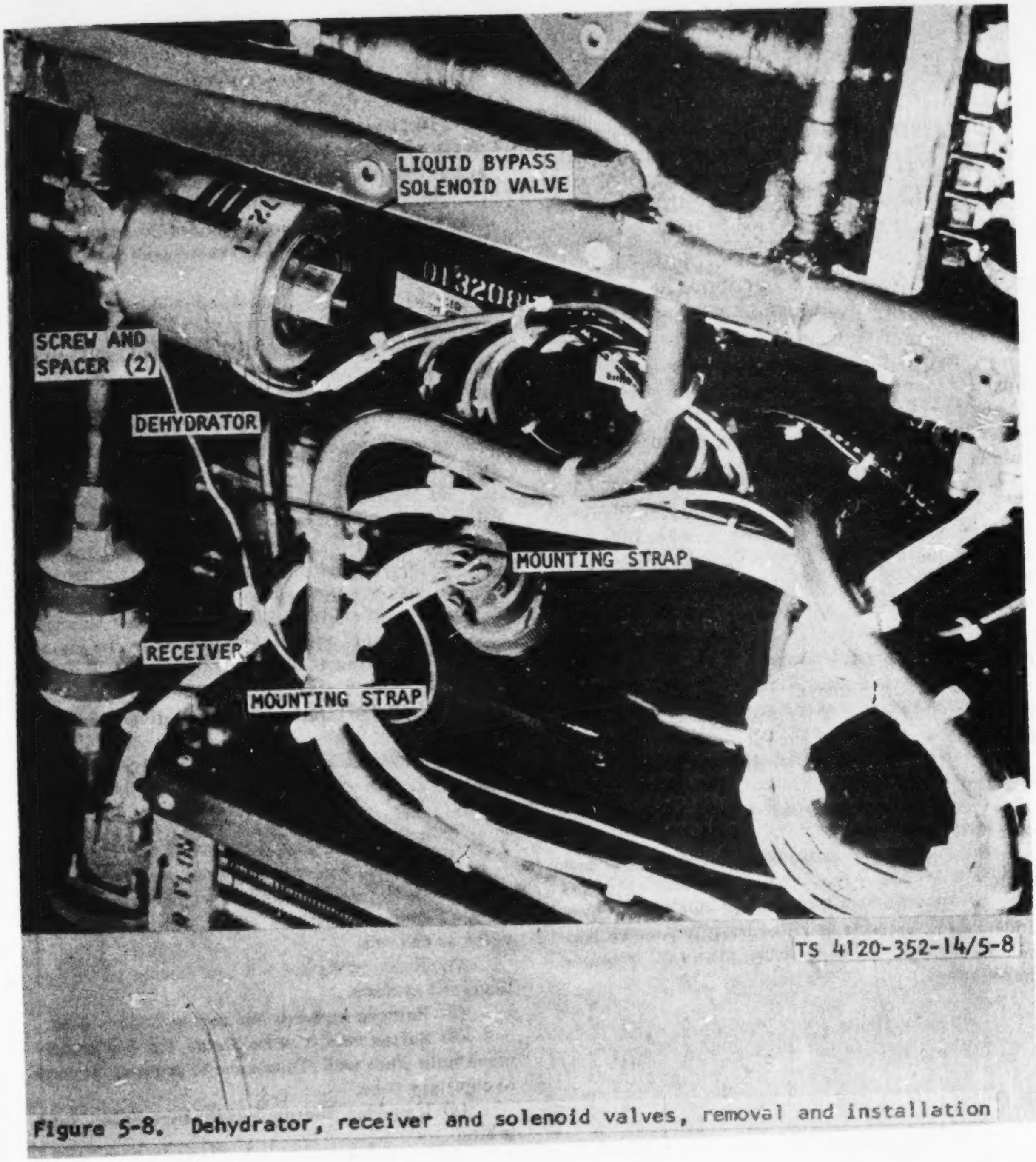

LIQUID BYPASS SOLENOID VALVE
SCREW AND SPACER (2)
DEHYDRATOR
MOUNTING STRAP
RECEIVER
MOUNTING STRAP
TS 4120-352-14/5-8

Figure 5-8. Dehydrator, receiver and solenoid valves, removal and installation

5-25. Receiver.

a. ***Removal.*** Refer to figure 6-1 and discharge the refrigerant system. Refer to figure 4-5 and remove rear top cover. Remove four screws and two mounting straps (fig. 5-8). Disconnect receiver tubing.

b. ***Installation.*** Install receiver and solder connections. Install two mounting straps and four screws using sealing compound on screw threads. Refer to figure 6-2 and charge the refrigerant system.

5-26. Liquid Sight Indicator.

a. ***Removal.*** Refer to figure 6-1 and discharge the refrigerant system. Remove housing rear top cover (figure 4-5). Remove two screws and lockwashers from sides of liquid sight indicator (fig. 1-2) and remove mounting bracket (fig. 5-8) from inside housing. Unsolder liquid sight indicator from tubing.

b. ***Installation.*** Solder liquid sight indicator on tubing. Place bracket over indicator on inside of housing and secure with two screws and lockwashers. Install housing top rear cover (figure 4-5). Refer to figure 6-2 and charge the refrigerant system.

5-27. Solenoid Valves.

a. ***Removal.*** Removal procedures for the bypass solenoid valve and the equalizer solenoid valve are the same except for the mounting hardware.

(1) Refer to figure 6-1 and discharge the refrigerant system.

(2) Refer to figure 4-5 and remove housing rear top cover.

(3) Disconnect solenoid valve electrical connector.

(4) Remove two socket-head cap screws from underside of valve body and carefully remove bonnet assembly. Do not drop plunger. Remove diaphragm.

CAUTION

Remove bonnet assembly and diaphragm before applying heat to valve body.

(5) To remove liquid bypass solenoid valve (figure 5-8), remove two screws and spacers and unsolder valve body from tubing. Remove bushings.

(6) To remove equalizer solenoid valve, remove two screws and lockwashers that secure valve body to bracket. Unsolder valve body and remove bushings.

b. ***Installation.*** Install solenoid valves as follows:

(1) Install bushings in valve body and solder body on tubing.

(2) When installing equalizer solenoid valve body, secure body to bracket with two screws and lockwashers installed from underside of bracket into valve body.

(3) When installing liquid bypass solenoid valve body, install spacers between body and housing and install two screws from outside of housing.

(4) Place diaphragm in the body with the pilot port extension away from body. Hold plunger with synthetic seat against pilot port. Make sure preformed packings are in place and lower bonnet assembly over plunger. Install body screws.

(5) Connect electrical connector.

(6) Refer to figure 4-5 and install housing rear top cover.

(7) Refer to figure 6-2 and charge the refrigerant system.

5-28. Thermal Expansion Valve.

a. ***General.*** The main thermal expansion valve is hermetically sealed and cannot be repaired.

b. ***Removal.*** Remove the thermal expansion valve as follows:

(1) Refer to figure 6-1 and discharge the refrigerant system.

(2) Remove housing top covers (figure 4-5).

(3) Soften mastic in bulb well (fig. 5-9) and remove bulb from well. Take care to prevent damage to capillary tube.

(4) Unsolder thermal expansion valve from tubing.

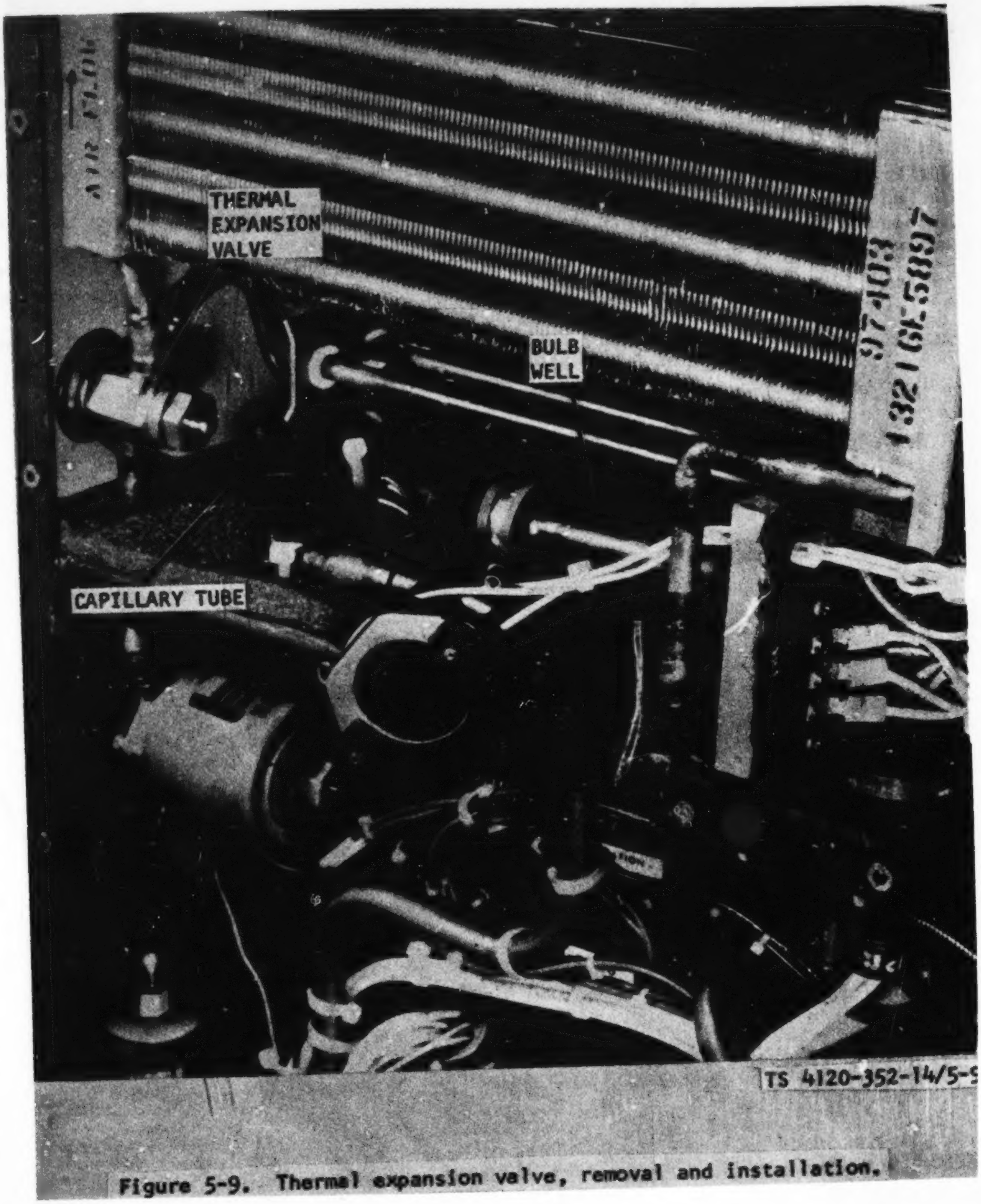

AIR FLOW
THERMAL EXPANSION VALVE
BULB WELL
CAPILLARY TUBE
97403
13211GE5897
TS 4120-352-14/5-9

Figure 5-9. Thermal expansion valve, removal and installation.

c. Installation. Install thermal xpansion valve (fig. 5-9) as follows:

(1) Solder valve to tubing.

(2) Insert approximately one ounce of thermal mastic in bulb well. Insert sensing bulb of expansion valve and move bulb back and forth to distribute mastic and set bulb approximately one inch beyond open end.

(3) Install housing top covers (figure 4-5).

(4) Refer to figure 6-2 and charge the refrigerant system.

5-29. Quench Thermal Expansion Valve.

a. General. The quench thermal expansion valve is hermetically sealed and cannot be repaired.

b. Removal. Remove the quench valve as follows:

(1) Refer to figure 6-1 and discharge the regrigerant system.

(2) Remove housing rear top cover (figure 4-5).

(3) Soften matic in bulb well (fig. 5-10) and remove bulb from well. Take care to prevent damage to capillary tube.

(4) Remove two screws, spacers, self-locking nuts and valve mounting brackets.

(5) Unsolder valve from tubing.

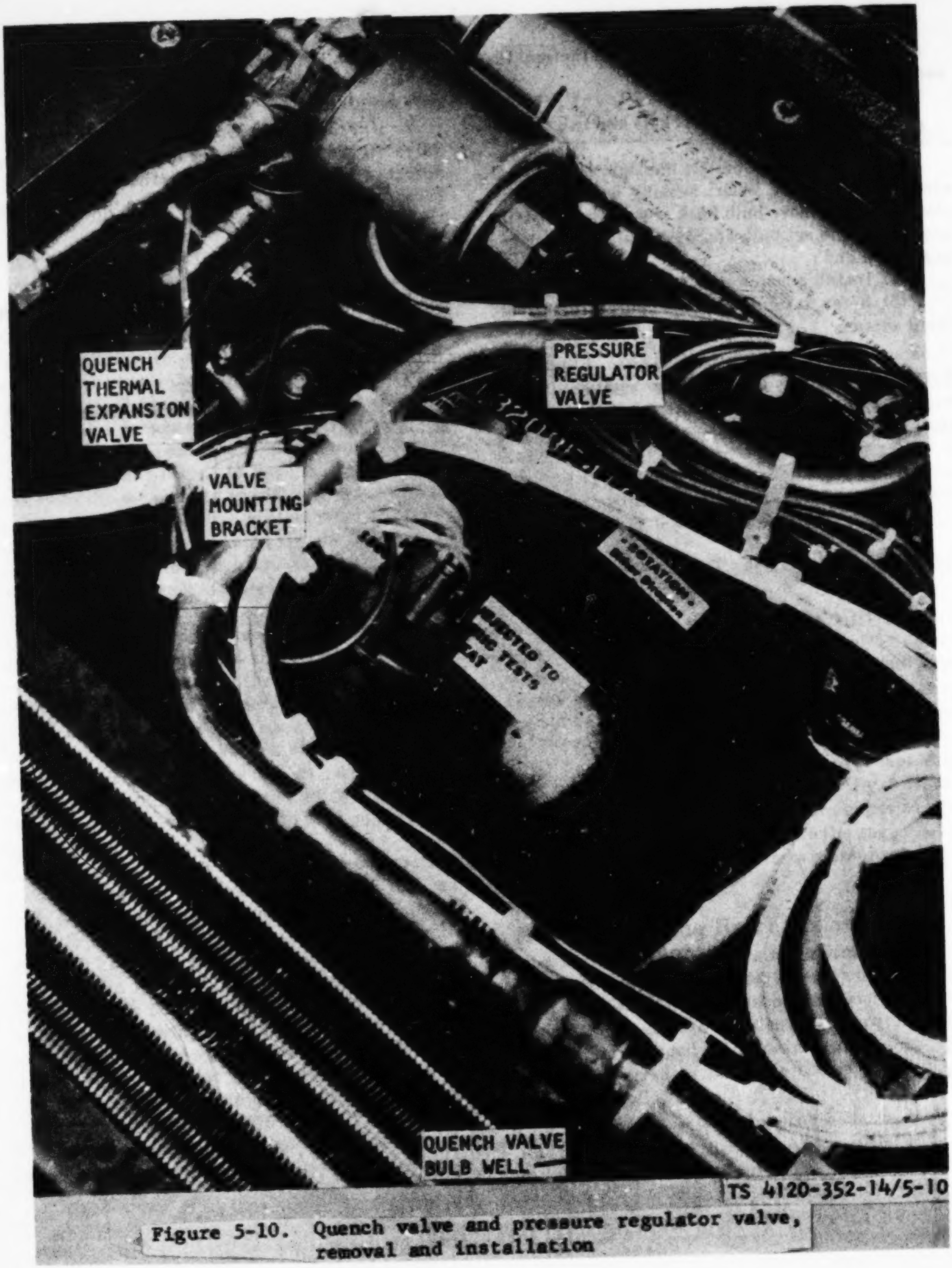

QUENCH THERMAL EXPANSION VALVE
PRESSURE REGULATOR VALVE
VALVE MOUNTING BRACKET
QUENCH VALVE BULB WELL
TS 4120-352-14/5-10

Figure 5-10. Quench valve and pressure regulator valve, removal and installation

c. ***Installation.*** Install the quench thermal expansion valve (fig. 5-10) as follows:

(1) Solder valve to tubing.

(2) Install mounting brackets and two screws, spacers and self-locking nuts.

(3) Insert approximately one ounce of thermal mastic in bulb well. Insert sensing bulb of expansion valve and move bulb back and forth to distribute mastic and set bulb approximately one inch beyond open end.

(4) Install housing rear top cover (figure 4-5).

(5) Refer to figure 6-2 and charge the refrigerant system.

5-30. Pressure Regualtor Valve.

a. ***Removal.*** Refer to figure 6-1 and discharge the refrigerant system. Remove housing top covers (figure 4-5). Refer to figure 5-10 and remove screw, lockwasher, loop clamp and spacer. Unsolder pressure regulator from tubing.

b. ***Installation.*** Solder pressure regulator valve (figure 5-10) on tubing and install loop clamp, spacer, screw and lockwasher. Install housing top covers (figure 4-5). Refer to figure 6-2 and charge the refrigerant system.

5-31. Motors.

Refer to paragraph 4-38 for removal and installation of motors.

5-32. Control Module.

Refer to paragraph 4-42 for removal and installation of control module.

CHAPTER 6
REPAIR INSTRUCTIONS

Section I. REFRIGERATION SYSTEM

6-1. General

The refrigerant system illustrated by the refrigerant flow diagram (fig. 5-1), is a mechanical, vapor cycle type circuit consisting of the evaporator, thermal expansion valve, motor-compressor, condenser, and the necessary valves and cutout devices for automatic control during operation. The thermal expansion valve releases high-pressure liquid refrigerant into the evaporator at reduced pressure. The liquid refrigerant begins to vaporize by absorbing heat from the air passing over the external surface of the evaporator coil. The heated vapor is sucked out of the evaporator section by the motor-compressor and forced into the condenser section under high pressure where it is cooled and condensed back into a liquid. The heat released during condensation is carried off by the condensing air stream. The liquid refrigerant flows from the condenser to a receiver, to a subcooler, and then to the thermal expansion valve. If the temperature control switch (evaporator return air thermostat) becomes satisfied, or the evaporator return air temperature is lower than the control switch set point, the refrigerant system will switch to a by-pass condition. The temperature control switch will activate the normally-open liquid bypass solenoid valve, closing the valve, and therefore shutting off the evaporator section of the unit. The motor-compressor will continue to pump as usual and the suction pressure will begin to drop. When it reaches approximately 65 psig (450 kPa), the pressure regulating valve will start to open in an effort to maintain the suction pressure above 55 psig (380 kPa) (approximately). As the suction temperature increases, due to the pressure regulating valve opening, the quench expansion valve will start to meter liquid refrigerant into the suction line in an effort to maintain the suction temperature below 75°F (24°C) (approx.), or 30°F (-1°C) super-heat (approx.). This action (the pressure regulator and quench valve actions) is totally automatic and also may occur at extreme conditions in an attempt to maintain the suction pressures (even during the cooling mode) at a condition above 55 psig (380 kPa) and the suction temperatures (measured at the quench bulb well) below 75°F (24°C). The condenser louvers are operated by a refrigerant powered piston located in high pressure part of the system. This piston should be fully extended (louvers open 80°F (27°C) (approx.) at 250 psig (1140 kPa) head pressure and fully closed at 165 psig (1140) kPa). Failure to perform this function could result in icing of the evaporator coil and/or cutout on the low pressure cutout.

6-2. Pressure Testing the Refrigerant System

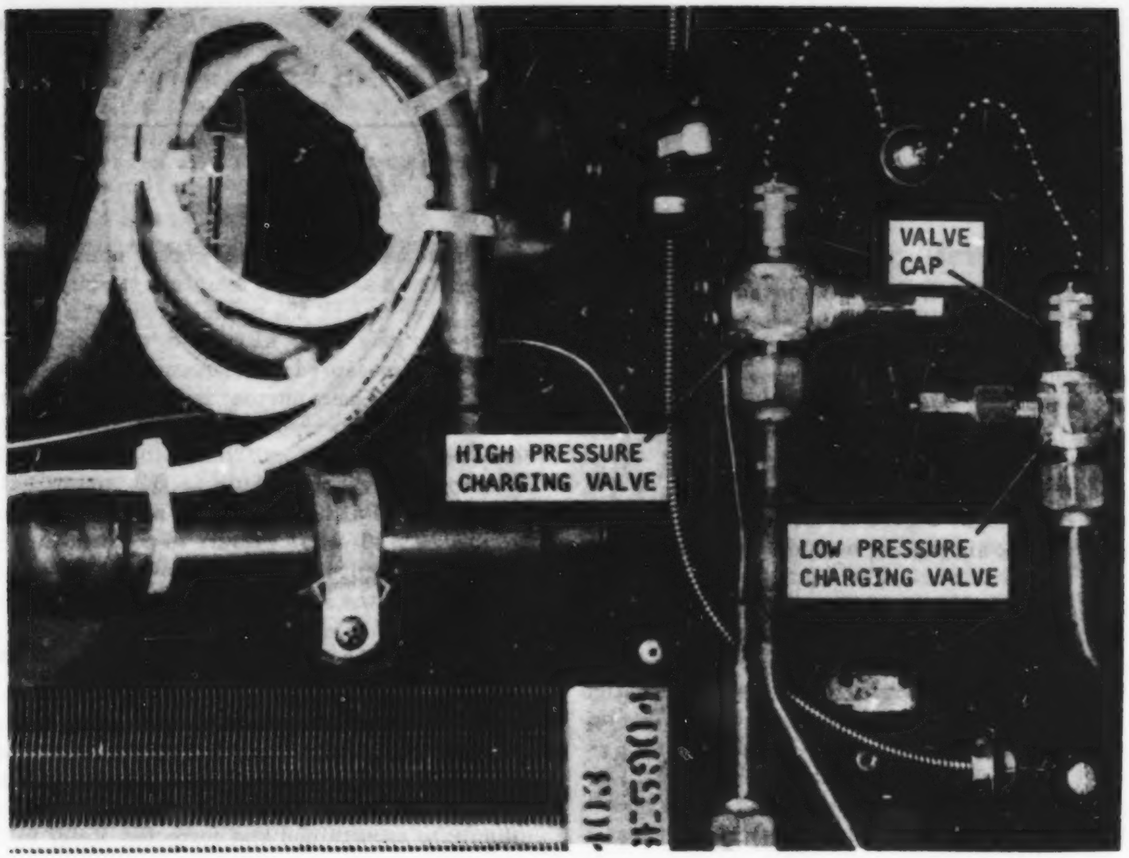
a. General. A pressure test will indicate whether the air conditioner is operating at normal or at abnormal pressures. When the air conditioner is not operating at normal pressures the cause should be ascertained and corrected. Refer to table 5-1 for troubleshooting chart.

b. System Pressure Test. Remove caps from high and low pressure service valves (fig. 5-7), connect suction and discharge pressure gages to their respective service valves. Compare the gage reading with the normal range of system pressure shown in table 6-1.

6-3. Servicing Refrigerant System

a. General. When the air conditioner must undergo maintenance that requires opening the system, the system must be discharged prior to maintenance, then purged, a new dehydrator installed, and the system charged after maintenance. Basic procedures involved in servicing the refrigerant system are as follows:

b. Discharging and Purging System. Refer to figure 6-1 for instructions on discharging or purging the refrigerant system.



TS 4120-352-14/6-1

TO DISCHARGE SYSTEM:
REMOVE ACCESS COVER.
REMOVE LOW PRESSURE CHARGING VALVE CAP. ATTACH A SUITABLE HOSE TO CHARGING VALVE AND DISCHARGE REFRIGERANT INTO A SAFE AREA.

NOTE:
TO PREVENT EXCESS LOSS OF OIL, DISCHARGE SYSTEM SLOWLY OVER A PERIOD OF TWO HOURS.

TO PURGE SYSTEM:
REMOVE HIGH PRESSURE CHARGING VALVE CAP.
CONNECT VALVE TO A CYLINDER OF DRY NITROGEN.
ATTACH A SUITABLE DISCHARGE HOSE TO LOW PRESSURE CHARGING VALVE.
OPEN NITROGEN VALVE AND ALLOW NITROGEN TO FLOW THROUGH SYSTEM UNTIL ALL MOISTURE IS FORCED OUT. CLOSE NITROGEN CYLINDER VALVE.
CONNECT A VACUUM PUMP TO HIGH AND LOW PRESSURE CHARGING VALVES AND HOLD A 29.0" Hg VACUUM FOR EIGHT HOURS.

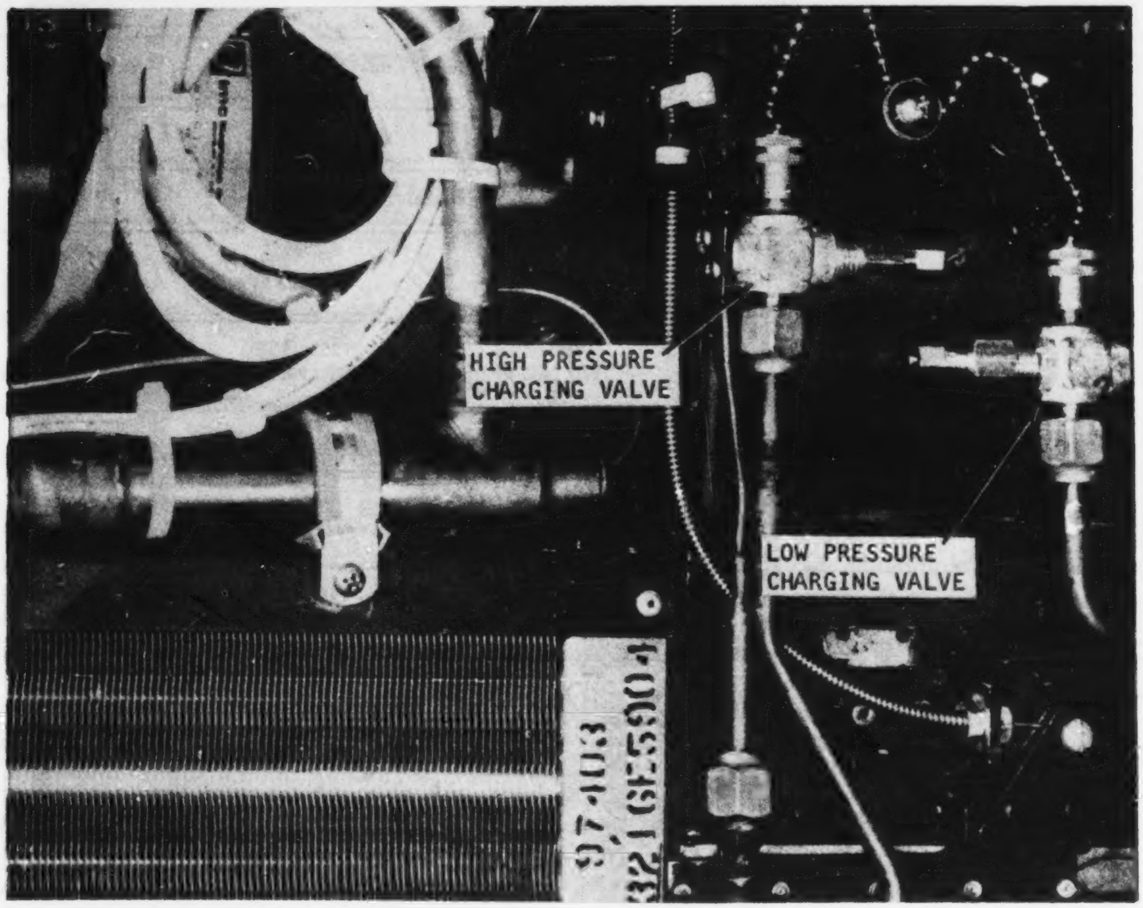
WARNING:
AVOID BODILY CONTACT WITH LIQUID REFRIGERANT AND AVOID INHALING REFRIGERANT GAS. BE ESPECIALLY CAREFUL THAT REFRIGERANT 22 DOES NOT COME IN CONTACT WITH EYES. IN CASE OF REFRIGERANT LEAKS, VENTILATE AREA IMMEDIATELY.

Figure 6-1. Discharging and purging refrigerant system.

Table 6-1. Normal Operating Pressures

	Outdoor Ambient Temperature			
	50°F (10°C)	*75°F (24°C)*	*100°F (38°C)*	*120°F (49°C)*
At 90°F (32°C) DB return air to unit				
Suction Pressure	58-65 psi (400-450 kPa)	58-70 psi (400-485 kPa)	60-75 psi (255-295 kPa)	75-90 psi (515-620 kPa)
Discharge Pressure	125-160 psi (860-1100 kPa)	175-210 psi (1200-1450 kPa)	255-295 psi (1750-2025 kPa)	370-410 psi (2550-2825 kPa)
At 80°F (27°C) DB return air to unit				
Suction Pressure	58-65 psi (400-450 kPa)	58-70 psi (400-485 kPa)	60-75 psi (415-515 kPa)	65-75 psi (450-515 kPa)
Discharge Pressure	120-155 psi (825-1070 kPa)	170-205 psi (1170-1415 kPa)	250-290 psi (1725-2000 kPa)	370-410 psi (2550-2825 kPa)

*c. **Charging the System***. Refer to figure 6-2 for instructions on charging the system with refrigerant.


HIGH PRESSURE
CHARGING VALVE
LOW PRESSURE
CHARGING VALVE
97-403
321GE5900

TS 4120-352-14/6-2(1)

NOTE: STEPS 1, 2 AND 3 APPLY ONLY TO A COMPLETELY EVACUATED SYSTEM. TO ADD ADDITIONAL REFRIGERANT TO A CHARGED SYSTEM, REFER TO STEPS 6 THRU 9.

STEP 1. REMOVE ACCESS COVER. REMOVE HIGH PRESSURE CHARGING VALVE CAP AND LOOSELY CONNECT CHARGING LINE OF DRUM TO VALVE.

STEP 2. OPEN REFRIGERANT DRUM VALVE SLIGHTLY TO PURGE AIR FROM CHARGING LINE. CLOSE REFRIGERANT DRUM VALVE AND TIGHTEN CONNECTION AT CHARGING VALVE.

Figure 6-2. Charging refrigerant system (Sheet 1 of 2).

STEP 3. SET THE REFRIGERANT DRUM IN AN INVERTED POSITION ON A SCALE.
DO NOT OPERATE THE AIR CONDITIONER.
OPEN CHARGING LINE VALVE AND CHARGING VALVE AND CHARGE REFRIGERANT SYSTEM UNTIL SYSTEM AND DRUM PRESSURES HAVE EQUALIZED, OR UNTIL 2.1 POUND OF REFRIGERANT HAVE ENTERED THE SYSTEM.

STEP 4. CLOSE VALVES AND CAREFULLY LOOSEN THE CHARGING LINE TO RELEASE TRAPPED PRESSURE.
DISCONNECT CHARGING LINE AND INSTALL CHARGING VALVE CAP.
OPERATE AIR CONDITIONER IN COOLING MODE FOR 15 MINUTES.

STEP 5. CHECK LIQUID SIGHT INDICATOR. IF SYSTEM IS SHORT OF REFRIGERANT, GAS BUBBLES WILL APPEAR REGULARLY IN THE INDICATOR. IF REFRIGERANT SYSTEM IS UNDERCHARGED, ADD ADDITIONAL REFRIGERANT, FOLLOWING STEPS 6 THROUGH 9.

STEP 6. USING SAME DRUM AND CHARGING LINE, PLACE DRUM IN AN UPRIGHT POSITION ON A SCALE. REMOVE CAP FROM LOW PRESSURE (SUCTION SIDE) CHARGING VALVE, AND LOOSELY CONNECT CHARGING LINE TO VALVE. PURGE AIR FROM LINE AS IN STEP 2.

CAUTION: WHEN ADDING REFRIGERANT, USE EXTREME CARE TO AVOID ADDING REFRIGERANT TO THE SYSTEM TOO FAST, WHICH WOULD CAUSE SLUGGING AT THE COMPRESSOR.

STEP 7. WITH THE AIR CONDITIONER OPERATING, ADMIT GAS TO SYSTEM SLOWLY (APPROXIMATELY 1 OUNCE PER MINUTE).
CONSTANTLY OBSERVE DRUM WEIGHT TO INSURE THAT ONLY 2.1 POUNDS TOTAL WEIGHT OF REFRIGERANT IS IN SYSTEM.

STEP 8. REPEAT STEP 4.

STEP 9. CHECK LIQUID SIGHT INDICATOR. IF INDICATOR REGULARLY SHOWS BUBBLES, REPEAT STEPS 6 THROUGH 9, ADDING REFRIGERANT IN 4 OUNCE INCREMENTS UNTIL INDICATOR IS CLEAR.

STEP 10. REPLACE ACCESS COVER.

TS 4120-352-14/6-2(2)

Figure 6-2. Charging refrigerant system (Sheet 2 of 2).

6-4. Repairing Refrigerant Leaks

a. Locate leak (para 4-52).

b. Discharge system (figure 6-1), repair leak, and recharge system (para 6-3).

NOTE

If soldering is necessary on any part of the system, a constant purge of dry nitrogen must be fed through the system being soldered to prevent scale formation within the system

6-5. Decontamination

a. General. The compressor is a hermetically sealed unit and cannot be repaired. An inoperative compressor is usually due to a mechanical failure or motor burnout. If the compressor is mechnically frozen or sustains a motor burnout, it must be replaced. A compressor failure generates high temperature causing a breakdown of oil, refrigerant and motor insulation, with the resulting formation of acid, moisture, sludge. The products are extremely corrosive and must be flushed from the system or repeated burnouts will occur.

b. Procedure.

(1) Discharge system and purge with nitrogen (figure 6-1).

(2) Remove defective motor-compressor (para 5-17).

(3) Remove dehydrator (para 5-24).

(4) With compressor out of system, purge all lines with dry nitrogen.

(5) Install a new compressor (para 5-17) containing a full and proper oil charge.

(6) Install new dehydrator (para 5-24). In step 10 this dehydrator will again be replaced.

(7) Triple evacuate system and charge with refrigerant R22.

(8) Start air conditioner (para 2-10) and operate unit for 24 hours.

(9) Discharge system and purge with nitrogen (para 6-3).

(10) Install new dehydrator (para 5-24).

(11) Evacuate system and recharge with refrigerant (para 6-3).

(12) Operate air conditioner.

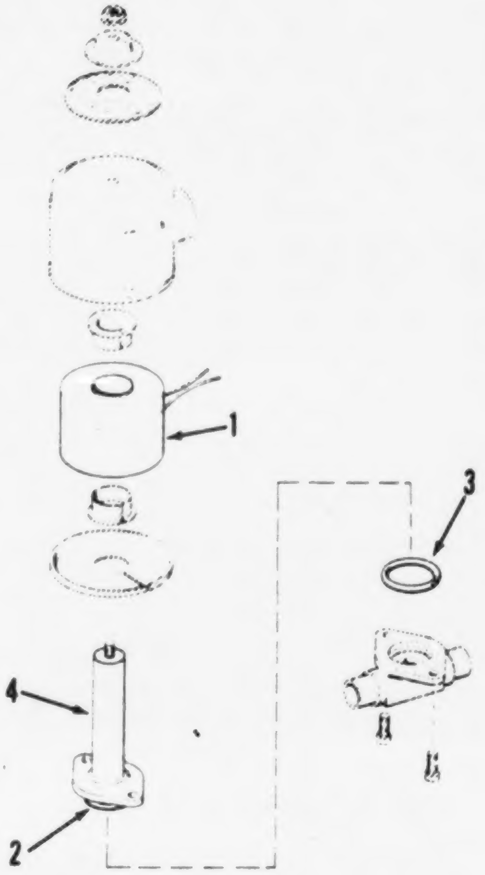
6-6. Evaporator and Condenser Coils

a. Inspection. Inspect coils for damaged tubing and bent fins. Inspect threaded holes for damaged or stripped threads.

b. Repair. Repair any leaks. Straighten bent fins. Repair or replace damaged tubing if possible. Replace coil if repair is not practical.

6-7. Solenoid Valve

a. General. Replaceable parts are the coil bonnet assembly, diaphragm and the preformed packing. See figure 6-3.



TS 4120-352-14/6-3

1. Coil
2. Diaphragm
3. Preformed packing
4. Bonnet assembly

Figure 6-3. Solenoid Valve, Exploded View

*b. **Coil Replacement.*** Replace coil as follows:

(1) Remove electrical connector from solenoid valve leads.

(2) Remove nut on top of valve housing. Lift housing and coil assembly fróm bonnet assembly.

(3) Remove coil from housing.

(4) Install coil bottom plate with edge upward.

(5) Install lower coil sleeve with flange at bottom. Install coil with lead exits and bottom.

(6) Install coil spring with flat edges upward and upper coil sleeve with flage at top. Sleeve passes through the coil spring.

(7) Install coil housing, data plate and nut.

*c. **Bonnet Assembly and Diaphragm Replacement.*** Replace parts as follows:

(1) To replace diaphragm (2, figure 6-3), remove two screws from body flanges and lift housing, coil and bonnet assembly (4) from body. Lift out diaphragm.

(2) To replace bonnet assembly, remove coil housing and coil (*b* above) from bonnet assembly.

(3) Assemble coil and bonnet assembly. Install diaphragm and preformed packing (3) on body. Install coil and bonnet assembly and secure with two screws.

6-8. Fan Motors.

*a. **General.*** The condenser fan motor and the evaporator fan motor are identical. Therefor, the following instructions apply equally to either motor.

*b. **Disassembly.*** Refer to figure 6-4 and disassemble motor as follows:

(1) Remove four hex nuts (1), four through bolts (2), and eight flat washers (3). Remove rear end bell (4).

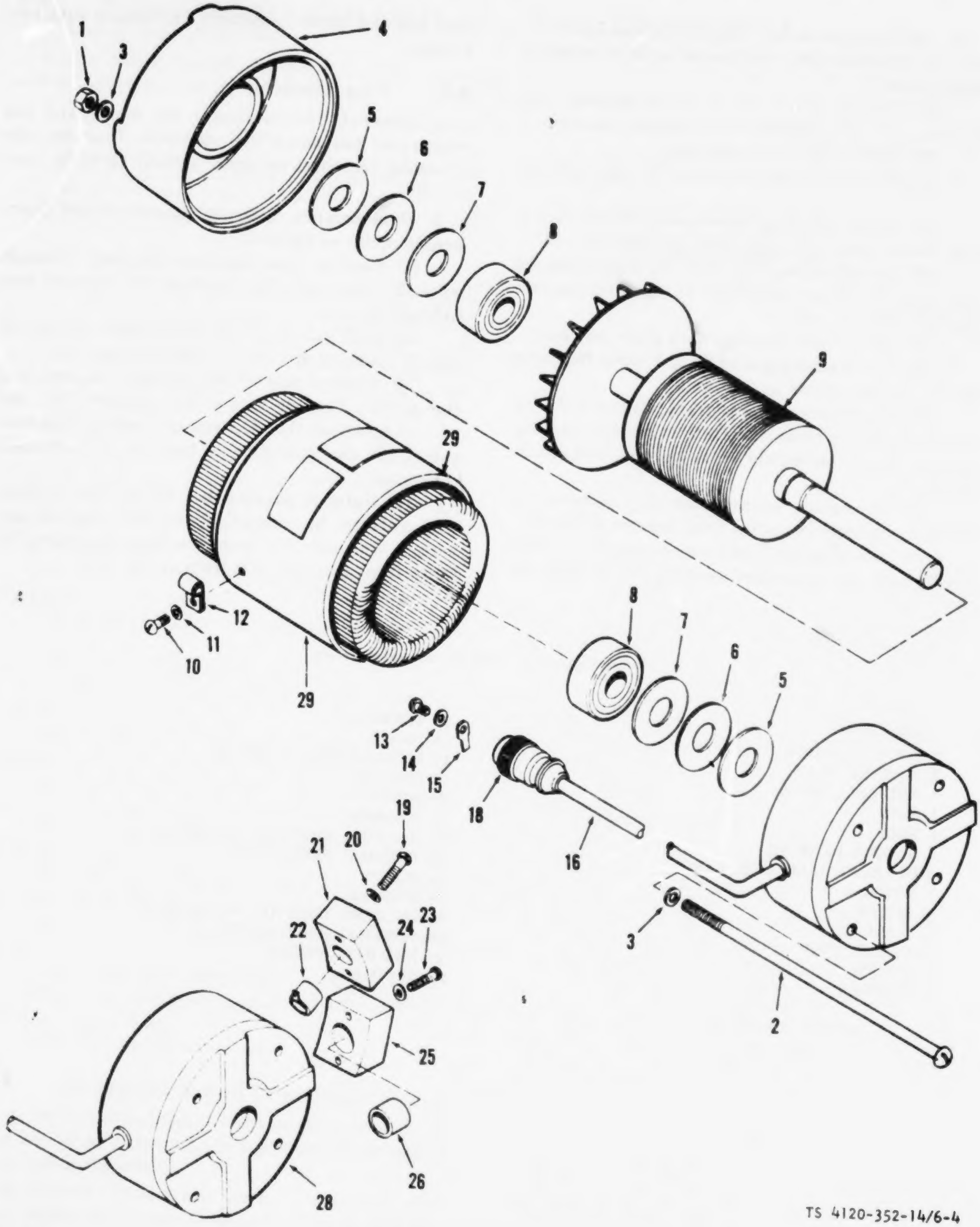
(2) Pull out rotor (9) and remove shims (5) and (6), bearing spacers (7) and bearings (8).

(3) Remove screw (10), washer (11), and loop clamp (12). Remove screw (13), washer (14), and ground terminal (15). Disconnect leads and remove cable (16) and strain relief bushing (17). Remove connector.

(4) Refer to paragraph 4-39 and remove thermal protector housings (21) and (25), thermal protectors (22) and (26), and attaching hardware. Remove front end bell (27) from stator (28).

Index, Figure 6-4. Fan motor, exploded view.

1. NUT, HEX
2. BOLT, THROUGH
3. WASHER, FLAT
4. END BELL, REAR
5. SHIM
6. SHIM
7. SPACER, BEARING
8. BEARING, BALL, ANNULAR
9. ROTOR
10. SCREW
11. WASHER
12. CLAMP, LOOP
13. SCREW
14. WASHER
15. TERMINAL
16. CABLE
17. BUSHING, STRAIN RELIEF
18. CONNECTOR
19. SCREW
20. WASHER
21. HOUSING, THERMAL PROTECTOR
22. THERMAL PROTECTOR
23. SCREW
24. WASHER
25. HOUSING, THERMAL PROTECTOR
26. THERMAL PROTECTOR
27. END BELL, FRONT
28. STATOR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TS 4120-352-14/6-4

Figure 6-4. Fan Motor, Exploded View

*c. **Cleaning, Inspection and Repair.*** Clean, inspect and repair parts as follows:

WARNING

Dry cleaning solvent, P-D-680, used to clean parts, is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100° - 138°F (38° - 59°C).

(1) Clean metal parts with cleaning solvent (Fed. Spec. P-D-680). Wipe off electrical parts with a clean cloth.

(2) Inspect wiring for damaged insulation and broken wiring. Repair damaged insulation.

(3) Inspect connector for damage.

(4) Inspect bearing for wear, galling or flat spots. Repace defective bearings.

(5) Inspect shaft for gouges or worn bearing surface. Repair minor defects.

(6) Inspect stator for damaged, broken or shorted wiring.

*d. **Assembly.*** Refer to figure 6-4 and assemble motor as follows:

(1) Install thermal protectors (22) and (26) and housings (21) and (25) in front end bell (28) as described in paragraph 4-39.

(2) Install connector (18) on cable (16). Install cable and strain relief bushing (17) in end bell (27). Partially install end bell on stator and connect terminal (15), with screw (13) and washer (14). Make electrical connections.

(3) Install shims (5) and (6), bearing spacers (7), bearings (8), and rotor (9).

(4) Install rear end bell (4). Place a flat washer (3) on each through bolt (2). Install through bolts in motor and secure each with a nut (1) and washer (3).

(5) Install loop clamp (12) on cable and secure clamp (12) on cable and secure clamp to stator frame with screw (10) and washer (11).

6-9. Control Module.

*a. **General.*** This paragraph covers repair of the control module. Testing, removal, and installation of switches and circuit breaker are covered in paragraphs 4-45 through 4-47. Parts of the control module are shown in figure 6-5.

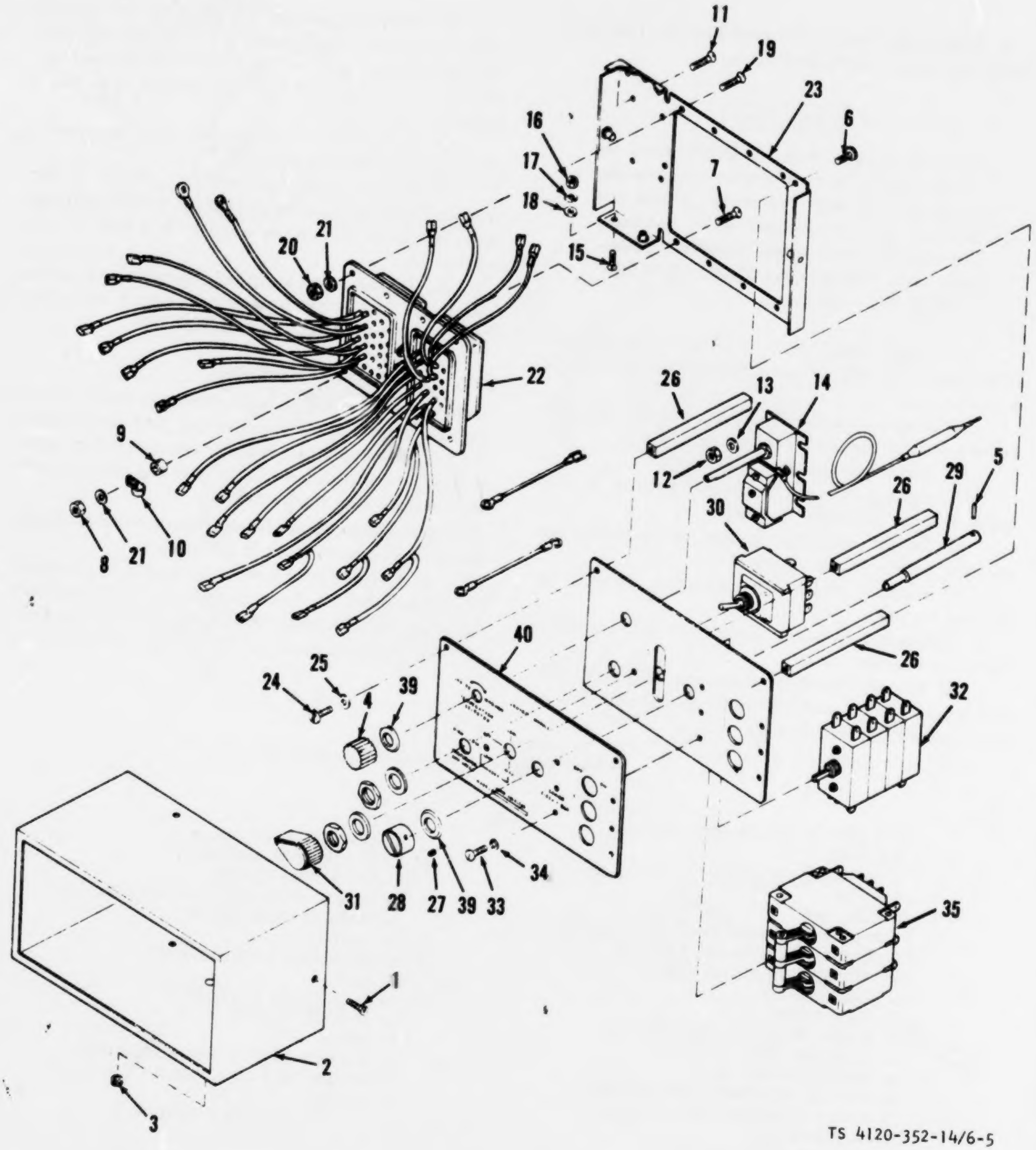
*b. **Disassembly.*** Refer to figure 6-5 and disassemble the control module as follows:

(1) Remove four screws (1) and split grommet (3). Slide cover (2) from module and pull capillary tube and bulb through opening in bottom of cover.

(2) Remove knob (4). Drive out roll pin (5).

Index, Figure 6-5. Control module, exploded view.

1. SCREW, FLAT CSK-HD, 4-40 x 7-16
2. COVER
3. GROMMET, SPLIT
4. KNOB
5. ROLL PIN
6. SCREW, SELF-LKG, FLAT-HD, 6-32x5/16
7. SCREW, FLAT CSK-HD, 6-32 x 7/8
8. NUT, HEX, SELF-LKG, 6-32
9. POST, SPACER
10. LOOP CLAMP
11. SCREW, FLAT CSK-HD, 6-32 x7/16
12. NUT, HEX, SELF-LKG, 6-32
13. WASHER, FLAT, NO. 6
14. SWITCH, TEMPERATURE CONTROL
15. SCREW, FLAT CSK-HD, 8-32 x 1/2
16. NUT, HEX, 8-32
17. WASHER, LOCK, NO. 8
18. WASHER, FLAT, NO. 8
19. SCREW, FLAT, 6-32 x 7/16
20. NUT
21. WASHER, FLAT, NO. 6
22. CONNECTOR ASSEMBLY
23. MOUNTING FRAME
24. SCREW, SELF-LKG, PAN-HD, 6-32x5/16
25. WASHER, FLAT, NO. 6
26. POST
27. SETSCREW, HEX-SOC, 4-48 x 1/8
28. KNOB
29. JACKSCREW EXTENSION
30. SWITCH, TOGGLE
31. KNOB
32. ROTARY SWITCH, MODE SELECTOR
33. SCREW, SELF-LKG, PAN-HD, 6-32 x 5/16
34. WASHER, FLAT, NO. 6
35. CIRCUIT BREAKER (3 PHASE)
36. MOUNTING PLATE
37. GROMMET
38. DESIGNATION PLATE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TS 4120-352-14/6-5

Figure 6-5. Control Module, Exploded View

(3) Disconnect leads. Remove three self-locking screws (6) and remove rear mounting frame (23) with connector and temperature control switch attached.

(4) Remove connector mounting screw (7), nut (8), loop clamp (10), washer (21) and spacer post (9) to release temperature control capillary tube.

(5) Remove four screws (11), nuts (12), and washers (13) and remove temperature control switch (14).

(6) Remove screw (15), nut (16), lock washer (17) and two flat washers (18) and disconnect ground lead.

(7) Remove seven remaining screws (19), nuts (20) and washers (21) and remove connector assembly (22) from mounting frame (23). Do not remove leads from connector unless they require replacement.

(8) Remove three screws (24), washers (25) and posts (26).

(9) Remove setscrew (27), knob (28), and jackscrew extension (29).

(10) Remove toggle switch (30) by removing locknut and washer.

(11) Remove mode selector knob (31), switch nut and washer and remove mode selector rotary switch (32).

(12) Disassemble handle of three phase circuit breaker (35). Remove six screws (33) and washers (34) securing three phase circuit breaker (35) to mounting plate (36). Remove circuit breaker.

(13) Remove grommets (37) and designation plate (38) from mounting plate.

WARNING

Dry cleaning solvent, P-D-680, used to clean parts, is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100° - 138°F (38° - 59°C).

*c. **Cleaning, Inspection and Repair.***

(1) Clean metal parts with cleaning solvent (Fed. Spec. P-D-680). Wipe off electrical parts with a clean cloth.

(2) Refer to paragraph 4-45 and test switches and circuit breaker. Replace defective parts.

(3) Inspect connector for damaged casing and bent or broken contacts. Check wiring for damaged insulation and broken wires. Check terminals for damage. Repair damaged wiring. Replace connector if defective.

(4) Check cover, frame and plates for bent condition. Straighten bent parts or replace parts as required.

*d. **Assembly.*** Refer to figure 6-5 and assemble control module as follows:

(1) Place designation plate (38) on mouning plate (36) and install circuit breaker (35) with screws (33) and washers (34). Install grommets (37).

(2) Install rotary switch (32) and secure with switch nut and washer. Install knob (31).

(3) Install toggle switch (30) and secure with switch nut and washer.

(4) Insert jackscrew extension (29) through opening in mounting plate and install knob (28) and setscrew (27).

(5) Install connector assembly (22) on rear mounting frame (23) and secure with seven screws (19), nuts (20), and washers (21). Omit screw in lower corner.

(6) Install screw (15), washers (18) lock washer (17) and nut (16) with ground terminal between the two flat washers (18).

(7) Install temperature control switch (14) on frame and secure switch with four screws (11), nuts (12), and flat washers (13). Install loop clamp (10) on capillary tube and install screw (7), spacer (9), washer (21), clamp and nut (8).

(8) Assemble three posts (26) to front plates with screws (24) and washers (25). Position posts against frame and install screws (6). Install roll pin (5).

(9) Pass capillary tube through opening in bottom of cover (2) and install cover on module. Install grommet (3) and four screws (1).

APPENDIX A
REFERENCES

A-1. Fire Protection

TB 5-4200-200-10	Hand Portable Fire Extinguisher for Army Users

A-2. Lubrication

C9100IL	Fuels, Lubricants, Oils and Waxes

A-3. Painting

TM 9-213	Painting Instructions for Field Use

A-4. Maintenance

TM 38-750	Army Maintenance Management System
TM 750-244-3	Procedures for Destruction of Equipment to Prevent Enemy Use
Fed. Speec. P-D-680	Dry Cleaning Solvent

A-5. Shipment and Storage

TM 740-90-1	Administration Storage of Equipment

APPENDIX B
MAINTENANCE ALLOCATION CHART

Section I. MAINTENANCE ALLOCATION CHART

1. General

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

b. Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component and the work measurement time required to perform the functions by the designated maintenance level. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance functions.

c. Section III lists the tools and test equipment required for each maintenance function as referenced from Section II.

2. Explanation of Columns in Section II

a. Column 1, Group Number. Column 1 lists group number to identify related components, assemblies, subassemblies, and modules with their next higher assembly. The appplicable groups are listed in the MAC in disassembly sequence beginning with the first group removed.

b. Column 2, Component/Assembly. This column contains the noun names of components, assemblies, subassemblies and modules for which maintenance is authoriaed.

c. Column 3, Maintenance Functions. This column lists the functions to be performed on the item listed in Column 2. The maintenance functions are defined as follows:

(1) **Inspect.** To determine serviceability of an item by comparing its physical, mechanical and/or electrical characteristics with established standards through examination.

(2) **Test.** To verify serviceability and detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

(3) **Service.** Operations required periodically to keep an item in proper operating condition, i.e., to clean (decontaminate), to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

(4) **Adjust.** To maintain within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to specified parameters.

(5) **Align.** To adjust specified variable elements of an item to bring about optimum or desired performance.

(6) **Calibrate.** To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipments used in precision measurement. Consists of comparison of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

(7) **Install.** The act of emplacing, seating, or fixing into position an item, part or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

(8) **Replace.** The act of substituting a serviceable like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.

(9) **Repair.** The application of maintenance services (inspect, test, service, adjust, align, calibrate, or replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

(10) **Overhaul.** That maintenance effort (service/action) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e., DMWR) in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to a like new condition.

(11) **Rebuild.** Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours/miles, etc.) considered in classifying Army

equipment/components.

d. ***Column 4, Maintenance Category.*** This column is made up of sub-columns for each category of maintenance. Work time figures are listed in these sub-columns for the lowest level of maintenance authorized to perform the function listed in Column 3. These figures indicate the average active time required to perform the maintenance function at the indicated category of maintenance under typical field operating conditions.

e. ***Column 5, Tools and Equipment.*** This column is provided for referencing by code, the common tool sets (not individual tools) special tools, test and support equipment required to perform the designated function.

3. Explantation of Columns in Section III

a. ***Column 1. Reference Code.*** This column consists of an arabic number listed in sequence from Column 5 of Section II. The number references the common tool sets, special tools and test equipment requirements.

b. ***Column 2. Maintenance Category.*** This column shows the lowest category of maintenance authorized to use the special tools or test equipment.

c. ***Column 3. Nomenclature.*** This column lists the name or identification of the common tool sets, special tools or test equipment.

d. ***Column 4. National/NATO Stock No. (NSN).*** This column is provided for the NSN of common tool sets, special tools and test equipment listed in the nomenclature column.

e. ***Column 5. Tool Number.*** This column lists the manufacturer's code and part number of tools and test equipment.

Section II. MAINTENANCE ALLOCATION CHART

9000 BTU/HR Air Conditioner, Compact, Horizontal

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(4) Tools & Equipment	(6) Remarks
			C	O	F	H	D		
01	FRAME & CASING								
	Panels	Repair		1.0					
		Replace		0.2					
	Louvers	Repair		1.0				1	
		Replace		0.2					
	Canvas Cover	Replace		1.0					
02	ELECTRICAL COMPONENTS								
	Transformer	Test		0.3					
		Replace		1.0					
	Resistor	Test		0.3					
		Replace		1.0					
	Rectifier	Test		0.3				1	
		Replace		1.0					
	Control Module	Test		0.3					
		Repair			2.0				
		Replace		1.0					
	Switches	Test		0.3					
		Replace		1.0					
03	STARTING & PROTECTING DEVICES								
	Capacitor	Test		0.3					
		Replace		1.0					
	Relays	Test		0.3					
		Replace		1.0					
	Pressure Switches	Test		0.3					
		Replace			4.0			1	
	Overload Protector	Test		0.3					
		Replace		1.0					
	Circuit Breakers	Test		0.3					
		Replace		1.0					
04	WIRING								
	Wiring Harness	Inspect	0.5					1	
		Repair		1.0					
		Replace			4.0				
05	GAGES								
	Sight Glass	Inspect	0.2					1	
		Replace			4.0				

Section II. MAINTENANCE ALLOCATION CHART (CONT)

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(4) Tools & Equipment	(6) Remarks
			C	O	F	H	D		
06	ELECTRICAL MOTOR								
	Condenser Motor	Test	0.2						
		Repair			1.0				
		Replace		2.0					
	Bearings	Replace			2.0				
	Condenser Fan	Inspect	0.2						
		Repair		1.0					
		Replace		1.0					
	Evaporator Motor	Test	0.2					1	
		Repair			4.0				
		Replace		2.0					
	Bearings	Replace			4.0				
	Evaporator Blower	Inspect	0.2						
		Clean	0.4						
		Replace			4.0				
07	REFRIGERATION COMPONENTS								
	Compressor	Test	0.3						
		Repair		1.0					
		Replace				8.0			
	Piping	Test	1.0					1	
		Repair			4.0				
		Replace				4.0			
	Valve Solenoid	Test	0.2						
		Replace			4.0				
	Dehydrator	Replace			4.0				
	Valve Expansion	Replace			4.0				
	Condenser Coil	Test		1.0				1	
		Repair			5.0				
		Replace				8.0			
	Evaporator Coil	Test		1.0					
		Repair			5.0				
		Replace				8.0			
08	HEATING ELEMENTS								
	Elements	Repair	1.0					1	
		Replace		2.0					
09	AIR FILTER AND MIST ELIMINATOR								
	Filters	Service		0.3				1	
		Replace		0.3					

. SUBCOLUMNS ARE AS FOLLOWS: C - OPERATOR/CREW; O - ORGANIZATIONAL;
F - DIRECT SUPPORT: H - GENERAL SUPPORT; D - DEPOT.
. . INDICATES WT/MH REQUIRED.

APPENDIX C

BASIC ISSUE ITEMS LIST AND ITEMS TROOP INSTALLED OR AUTHORIZED LIST

Section I. INTRODUCTION

C-1. Scope

This appendix lists items which accompany the air conditioner or are required for installation, operation, or operator's maintenance.

C-2. General

This Basic Issue Items List is divided into the following sections:

a. Basic Issue Items - Section II. A list of items which accompany the air conditioner and are required by the crew-operator for installation, operation, or maintenance.

b. Maintenance and Operating Supplies - Section III. A list of items of tools and test equipment.

C-3. Explanation of Columns

The following provides an explanation of columns in the tabular list of Basic Issue Items, Section II.

a. Source, Maintenance, and Recoverability Codes (SMR):

(1) Source code, indicates the source for the listed item. Source codes are:

Code	*Explanation*
P	Repair Parts, Special Tools and Test Equipment supplied from the GSA/DSA, or Army supply system and authorized for use as indicated maintenance categories.
P2	Repair Parts, Special Tools and Test Equipment which are procured and stocked for insurance purposes because the combat or military essentiality of the end item dictates that a minimum quantity be available in the supply system.
M	Repair Parts, Special Tools and Test Equipment which are not procured or stocked, as such, in the Supply System but are to be manufactured at indicated maintenance levels.
A	Assemblies which are not procured or stocked as such, but are made up of two or more units. Such component units carry individual stock numbers and descriptions, are procured and stocked separately and can be assembled to form the required assembly at indicated maintenance categories.
X	Parts and assemblies that are not procured or stocked because the failure rate is normally below that of the applicable end item or component. The failure of such part or assembly should result in retirement of the end item from the supply system.
X1	Repair parts which are not procured or stocked. The requirement for such items will be filled by use of the next higher assembly or component.
X2	Repair parts, Special Tools and Test Equipment which are not stocked and have not foreseen mortality. The indicated maintenance category requiring such repair parts will attempt to obtain the parts through cannibalization or salvage, the item may be requisitioned with exception data, from the end item manager, for immediate use.
G	Major assemblies that are procured with PEMA funds for initial issue only as exchange assemblies at DSU and GSU level. These assemblies will be stocked above DS and GS level or returned to depot supply level.

(2) Maintenance code, indicates the lowest category of maintenance authorized to install the listed item. The maintenance level code is:

Code	*Explanation*
R	Applied to repair parts, (assemblies and components) special tools and test equipment which are considered economically reparable at direct and general support maintenance levels. When the item is no longer economically reparable, it is normally disposed of at the GS level. When supply considerations dictate, some of these repair parts may be listed for automatic return to supply for depot level repair as set forth in AR 710-50. When so listed, they will be replaced by supply on an exchange basis.
S	Repair parts, special tools, test equipment and assemblies which are economically reparable at DSU and GSU activities and which normally are furnished by supply on an exhange basis. When items are determined by a GSU to be uneconomically reparable, they will be evacuated to a depot for evaluation and analysis before final dispostion.
T	High dollar value recoverable repair parts, special tools and test equipment which are subject to spe-

	cial handling and are issued on an exchange basis. Such items will be repaired or overhauled at depot maintenance activities only. No repair may be accomplished at lower levels.
U	Repair parts, special tools and test equipment specifically selected for salvage by reclamation units because of precious metal content, critical materials, high dollar value or reusable casings or castings.

b. National Stock Number. This column indicates the National Stock Number assigned to the item and will be used for requisitioning purposes.

c. Description. This column indicates the National item name and any additional description of the item required. The abbreviation "w/e", when used as part of the nomenclature, indicates the Nationcl Stock Number, includes all armament, equipment, accessories, and repair parts issued with the item. A part number or other reference number is followed by the applicable five-digit National Supply Code for manufacturers in parenthesis. Repair parts quantities included in kits, sets, and assemblies are shown in front of the repair part name.

d. Unit of Measure (U/M). A two-character alphabetic abbreviation indicating the amount or quantity of the item upon which the allowances are based, e.g., ft, ea, pr, etc.

e. Quantity Incorporated in Unit. This column indicates the quantity of the item in the assembly group. A "V" appearing in this column in lieu of a quantity indicates that a definite quantity cannot be indicated (e.g., shims, spacers, etc.).

f. Quantity Furnished With Equipment. This column indicates the quantity of an item furnished with the equipment.

g. Illustration. This column is divided as follows:

(1) **Figure Number.** Indicates the figure number of the illustration in which the item is shown.

(2) **Item Number.** Indicates the callout number used to reference the item in the illustration.

Section II. BASIC ISSUE ITEMS

(1) SMR CODE	(2) NATIONAL STOCK NUMBER	(3) REF NO & MFR CODE	(3) DESCRIPTION	(3) USABLE ON CODE	(4) UNIT OF MEAS	(5) QTY FURN WITH EQUIP	(6) ILLUSTRATION (A) FIG. NO.	(6) ILLUSTRATION (B) ITEM NO.
			Group 31 Basic Issue Items Manufacturer Installed					
PO	5220-00-559-9618		Case: Maintenance and operation manuals, cotton duck, water repellant mildew resistant, MIL-B-11743B.		ea	1		

Section III. TOOLS AND TEST EQUIPMENT REQUIREMENTS

(1) REF CODE	(2) MAINT CATEG.	(3) NOMENCLATURE	(4) NATIONAL STOCK NUMBER	(5) TOOL NUMBER
W51362	O	Tool Kit, Service Refrigeration Unit	5180-00-596-1474	SC 5180-90-CL-N18

ALPHABETICAL INDEX

A

	Paragraph	Page
Adjustment:		
Condenser Louver Control	5-20	5-13
Fresh Air Damper	4-19	4-10
Administrative Storage	1-6	1-1
Air Filter	4-17	4-8

B

	Paragraph	Page
Brazing	5-6	5-6

C

	Paragraph	Page
Capacitors:		
Replacement	4-15	4-6
R. F. I. Suppression	4-14	4-6
Charging Valves	5-22	5-18
Circuit Breaker:		
Installation, Removal and Testing	4-42	4-33
Compressor:		
General	5-17a	5-7
Inspection	4-49	4-42
Installation	5-17c	5-9
Removal	5-17b	5-7
Testing and Repair	4-49	4-42
Compressor Motor Relay:		
Installation, Removal and Testing	4-43	4-36
Condenser Coil:		
Inspection and Replacement	6-6	6-6
Servicing	4-23	4-16
Condenser Fan Motor Switch	4-40	4-31
Condenser Guard and Louver:	4-20	4-12
Condenser Louver Actuator and Control	5-20	5-13
Control Circuit Breaker	4-42	4-33
Control Module:		
General	4-42	4-33
Installation, Removal, Repair and Testing	6-9	6-9
Controls and Instruments	2-6	2-4
Cooling Operation	2-8	2-8
Covers, Housing	4-21	4-14

D

	Paragraph	Page
Daily Preventive Maintenance Services	3-4	3-1
Dehydrator:		
Installation and Removal	5-24	5-18
Description:		
Air Conditioner	1-8	1-4
Refrigeration System	6-1	6-1
Destruction to Prevent Enemy Use	1-5	1-1
Differences Between Models	1-7	1-1
Drains:		
Operator's Maintenance	3-9	3-3
Tubing Replacement	4-25	4-16

E

	Paragraph	Page
Evaporator Air Inlet and Outlet Louvers	4-18	4-10
Evaporator Coil and Mist Eliminator Holder:		
Repair	6-6	6-6
Replacement	5-18	5-9
Evaporator Drain Tubing	4-25	4-16
Evaporator Fan Assembly	4-38	4-25
Evaporator Fan Toggle Switch:		

ALPHABETICAL INDEX (Cont)

	Paragraph	Page
Installation, Removal and Testing	4-39	4-31
Expansion Valves:		
Replacement, Thermal Expansion Valve	5-28	5-20
Replacement, Quench Valve	5-29	5-22
F		
Fan Motors:		
Removal and Installation	4-38	4-25
Disassembly and Reassembly	6-8	6-7
Filter, Return Air; Servicing	4-17	4-8
Fresh Air Screen; Replacement	4-19	4-10
Fresh Air Vent Damper:		
Adjustment	4-27	4-17
Cleaning, Inspection and Repair	4-29	4-20
Installation	4-30	4-20
Removal	4-28	4-20
G		
Gaskets	5-8	5-6
H		
Hardware	5-9	5-6
Heater Elements	4-35	4-23
Heater Relay:		
Installation, Removal and Testing	4-43	4-36
Heater Thermostatic Switch	4-34	4-21
Heating Operation	2-8	2-8
High Pressure Cutout Switch:		
Replacement and Testing	4-47	4-42
Housing Covers	4-21	4-14
I		
Identification	1-9	1-6
Inspecting Equipment:		
Operator's Inspection	2-3	2-1
Organizational Inspection	4-2	4-1
Installation	4-3	4-1
Insulation	5-8	5-1
J		
Junction Box:		
Assembly, Disassembly, Installation, Removal, and Testing	4-43	4-36
L		
Liquid Sight Indicator:		
Operator's Maintenance	3-10	3-3
Replacement	5-26	5-20
Louver Control Actuator:		
Control Adjustment	4-20	4-12
Louvers:		
Condenser	4-20	4-12
Evaporator	4-18	4-10
Operator's Maintenance	4-16	4-8
Low Pressure Cutout Switch:		
Replacement and Testing	5-21	5-16
Lubrication:		
Compressor	3-2	3-1
Fan Motors	3-1	3-1

ALPHABETICAL INDEX (Cont)

	Paragraph	Page
M		
Maintenance Repair Parts:		
Direct Support	5-3	5-1
Operator's	4-6	4-1
Mode Selector Switch:		
Installation, Removal and Testing	4-42	4-1
Model Numbers	1-9	1-6
Motors:		
Removal and Installation	4-38	4-25
Thermal Protector Replacement	4-38	4-25
Mist Eliminator:		
Servicing	4-17	4-8
O		
Operating Controls	2-6	2-4
Operation:		
In Dusty or Sandy Areas	2-12	2-15
In Extreme Cold	2-10	2-15
In Extreme Heat	2-11	2-15
In Salt Water Areas	2-14	2-15
Operating Under Usual Conditions	2-7	2-8
Starting	2-8	2-8
Stopping	2-9	2-8
Operator's Maintenance:		
Drains	3-9	3-3
Liquid Sight Indicator	3-10	3-3
Screen	3-8	3-3
Operator's Troubleshooting Chart	3-6	3-2
P		
Pressure Regulator Valve	5-30	5-24
Pressure Relief Valve	5-28	5-18
Pressure Switches:		
Installation and Removal	5-21	5-16
Pressure Test	6-2	6-1
Preventive Maintenance Services:		
Operator's Daily	3-6	3-2
Organizational	4-9	4-1
Q		
Quarterly Preventive Maintenance Services	4-10	4-1
Quench Expansion Valve	5-29	5-22
R		
Radio Interference Suppression:		
Components	4-14	4-6
General Methods	4-13	4-6
Replacement of Components	4-15	4-6
Receiver:		
Installation and Removal	5-25	5-20
Record and Report Forms	1-3	1-1
Rectifier	4-46	4-42
Refrigerant System:		
Charging	6-3	6-1
Decontamination	6-5	6-6
General Description	6-1	6-1
General Maintenance Instructions	5-7	5-6
Inspection	4-51	4-44
Leak Testing	4-52	4-44
Pressure Test	6-2	6-1

ALPHABETICAL INDEX (Cont)

	Paragraph	Page
Purging	6-3	6-1
Servicing	6-3	6-1
Repairing Leaks	6-4	6-6
Report Forms	1-3	1-1
Reporting of Errors	1-3	1-1
Rotary Switch, Mode Selector:		
Installation, Removal and Testing	4-42	4-33
Rust and Corrosion, Removal	5-13	5-6

S

	Paragraph	Page
Schematic Diagrams	1-10	1-8
Service Valves	5-22	5-18
Shims	5-10	5-6
Solenoid Valves	5-27	5-20
Special Tools and Equipment:		
Direct and General Support	5-2	5-1
Organizational	4-5	4-1
Starting	2-8	2-8
Stopping	2-9	2-8

T

	Paragraph	Page
Tabulated Data	1-9	1-6
Temperature Selector Switch:		
Installation, Removal and Testing	4-42	4-33
Testing Electrical System	4-32	4-20
Testing Refrigerant System:		
Leak Test	4-52	4-44
Pressure Test	6-2	6-1
Thermostatic Switches:		
Condenser Fan Motor	4-46	4-42
Heater	4-434	4-21
Thermal Expansion Valve	5-28	5-20
Threads, Damaged; Repairing	5-11	5-6
Time Delay Relay:		
Installation, Removal, and Testing	4-39	4-31
Transformer	4-45	4-40
Troubleshooting:		
Direct and General Support	5-4	5-1
Operators	3-5	3-2
Organizational	4-11	4-2
Tubing and Fittings:		
Inspection	4-51	4-44
Leak Testing	4-52	4-44
Maintenance Instructions	5-14	5-6

U

	Paragraph	Page
Unloading Equipment	2-1	2-1
Unpacking Equipment	2-2	2-1

V

	Paragraph	Page
Valves	5-15	5-6
Ventilation Operation	2-8	2-8

W

	Paragraph	Page
Wiring Diagrams	1-10	1-8
Wiring Harnesses and Leads	4-33	4-21

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Chief of Staff

Official:

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Brigadier General, United States Army
The Adjutant General

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DATE 16 DEC 74

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PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.	
6	2-1 a			In line 6 of paragraph 2-1a the manual states the engine has 6 cylinders. The engine on my set only has 4 cylinders. Change the manual to show 4 cylinders
81		4-3		Callout 16 on figure 4-3 is pointing at a bolt. In the key to fig. 4-3, item 16 is called a shim. Please correct one or the other.
125	line 20			I ordered a gasket, item 19 on figure B-16 by NSN 2910-00-762-3001. I got a gasket but it doesn't fit. Supply says I got what I ordered so the NSN is wrong. Please give me a good NSN

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4300 Goodfellow Boulevard
St. Louis, MO 63120

TEAR ALONG DOTTED LINE

FOLD BACK

REVERSE OF DA FORM 2028-2 (TEST)

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL MANUALS

THEN. . .JOT DOWN THE DOPE ABOUT IT ON THIS FORM, TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL!

SOMETHING WRONG WITH THIS MANUAL?

FROM: (YOUR UNIT'S COMPLETE ADDRESS)

DATE

PUBLICATION NUMBER	DATE	TITLE
TM 5-4120-352-14		AIR CONDITIONER, HORIZONTAL

BE EXACT. . .PIN-POINT WHERE IT IS				IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
PAGE NO.	PARAGRAPH	FIGURE NO.	TABLE NO.	

TYPED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER	SIGN HERE:

DA FORM 1 AUG 74 2028-2 *(TEST)*

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR MANUAL "FIND," MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

FILL IN YOUR
UNIT'S ADDRESS

FOLD BACK

DEPARTMENT OF THE ARMY

OFFICIAL BUSINESS

PENALTY FOR PRIVATE USE, $300

POSTAGE AND FEES PAID
DEPARTMENT OF THE ARMY
DOD-314

Commander
U.S. Army Troop Support and Aviation
Materiel Readiness Command
ATTN: DRSTS-MTPS
4300 Goodfellow Boulevard
St. Louis, MO 63120

ALONG DOTTED LINE

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REVERSE OF DA FORM 2028-2 (TEST)

The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimenter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigrams = .035 ounce
1 dekagram = 10 grams = .35 ounce
1 hectogram = 10 dekagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 38.82 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimenter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	3.94
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.365	metric tons	short tons	1.102
pound-inches	newton-meters	.11375			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C